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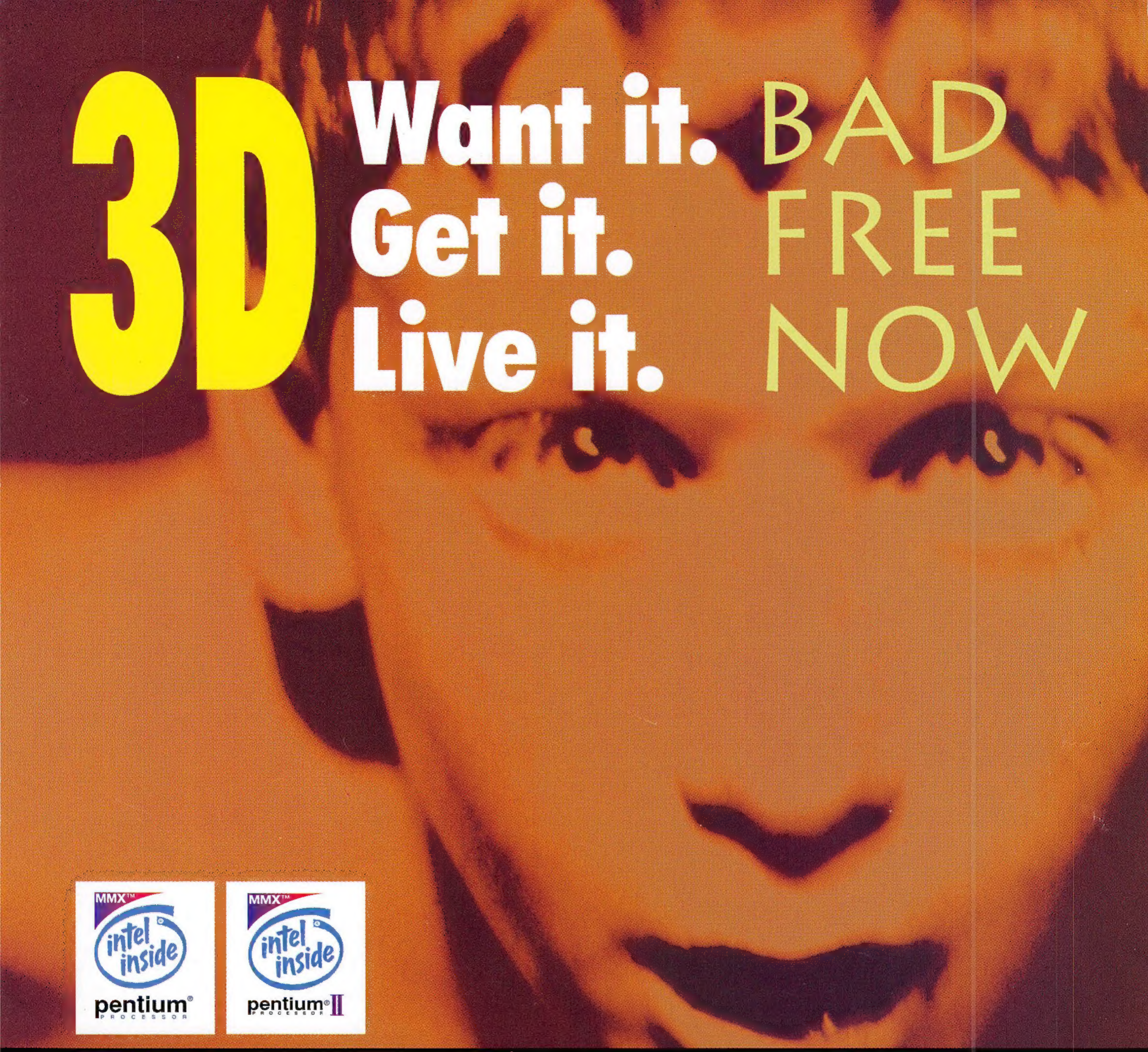
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ED WORD

All things to all people

"What sound card should I get?"... "I just inherited the family fortune. Should I go with a 300MHz P-II or the SGI O2?"... "The S3 in my Packard-Bell caught fire. What should I replace it with?"

We get droves of letters like this every month. And we love 'em. They tell us exactly what decisions our readers are making. That helps us tailor the content to better serve you.

But we also get letters insisting we recommend the best 3D card, or the best CPU, or the best system. People want simple, clear-cut answers in the hectic changing world of cutting-edge computing. And we want to provide that answer, but...

It's not so simple.

Some magazines toss you a list of the best this and the best that. Boom! Cut and dry. In their all-knowing might, they have decided that this monitor (or mouse, or modem) is the perfect choice for *all* people. Other magazines give you 50 words each on the 300 latest laser printers, or abstract benchmarks for 500 systems selling under $1,000. Both of these approaches miss the point.

We won't declare a single product to be the end-all-be-all for every *boot* reader. As hardcore power users, you're too diverse a group. One person may insist on ultimate gaming performance from a video card; the next may demand versatile video-in and video-out in order to scratch his creative itch. Someone else may need massive resolutions with blindingly fast refresh rates for meticulous image-editing missions.

At the same time, we don't want to bombard you with every single bohunk product that wanders through our door. We understand what you crave, and we filter out the crap so you don't have to. Do you really care about company XYZ's latest 133MHz "family" system? We didn't think so.

These choice in-depth examinations deliver the real dirt.

Sorry we can't make it any easier. You need to decide what your exact needs are. But once you do, we'll steer you in the right direction to fulfilling all those needs. Keep those letters comin' and I'll keep reading each and every one!

Brad Dosland
Editor in Chief

NEWS

16 bootWire **News** that **matters**. In a galaxy not-so-far away, the **rebel OpenGL** API fights a **battle** of features against the **empire's Direct3D** standard. Read how this year's **SIGGRAPH** convention in Los Angeles turned out to be the battle of the **Deathstar**. ALSO: Not satisfied with the **limited choices** found on your local PC store's shelves? Not willing to **sacrifice the quality** and service of a brand-name PC? Your **prayers** have been **answered**, as many of the **major** players in the PC market make the move to the **direct-marketing** model.

VOICES

25 The Saint **Alex St. John** explains why all the **drivers** in your PC are so hideously **broken**.

27 Game Theory **T. Liam McDonald** is deeply **offended** by all those people who are deeply offended by **offensive** games.

29 On the Line **Shel Kimen** wants to help you **filter** through all the **crap** that stands between you and **good** tech knowledge.

31 Fast Forward **Tom Halfhill** predicts **low-end** PC boxes will soon be more **popular** than today's **full-fledged** models.

112 Glitch **Jon Phillips** thinks the **ISA bus** does matter, and he's found the **ultimate** source of ISA **love**.

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5 Comm Port Readers air out the **buzz** via e-mail, fax, and pastiche postcards.

12 bootDisc A guide to the **joys** of our shiny silver platter. This month: Visual Page 1.0, X-Car (plus the 3Dfx version!), Fallout, Warlords III, and Panzer General II.

20 Pure Lust Tech toys for **digital** girls and boys.

62 White Paper: Audio File Resolving IRQsome Conflicts. Forget Plug 'n Play. If you're **carbo-loading** your PC, you're gonna need to **roll up those sleeves** and manually **configure** that bad boy. Here's what you **need to know**.

68 bootWorthy: Storage-o-Rama **All good things** must come to an end and that **stalwart** hard drive that came with your PC will eventually **fill**. Check **here** when that time inevitably comes.

jaz
Iomega jaz

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76 Previews ***Exclusive!*** *The straight-from-the-source **scoop** on Intel's next-gen CPU Deschutes! How does a **500MHz** P-II with 2MB of L2 sound to **you**?*

83 Reviews *Last month, we thought we'd seen the **best notebook PC ever**. We were **wrong**. This month's contender **kicks ass** over many of the desktop systems we've seen lately.*

ALSO:

- *Sexy new **flat panel technology** comes of age with these hot new displays.*
- *S3's PCI-based **Sonic Vibes** sound card is revolutionary.*
- *A slew of CD-ROM drives touted at **24x** are exposed for what they really are.*
- *Vid-chip legend **Trident** steps up with their its **3D** offering.*

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44 DirectX Files

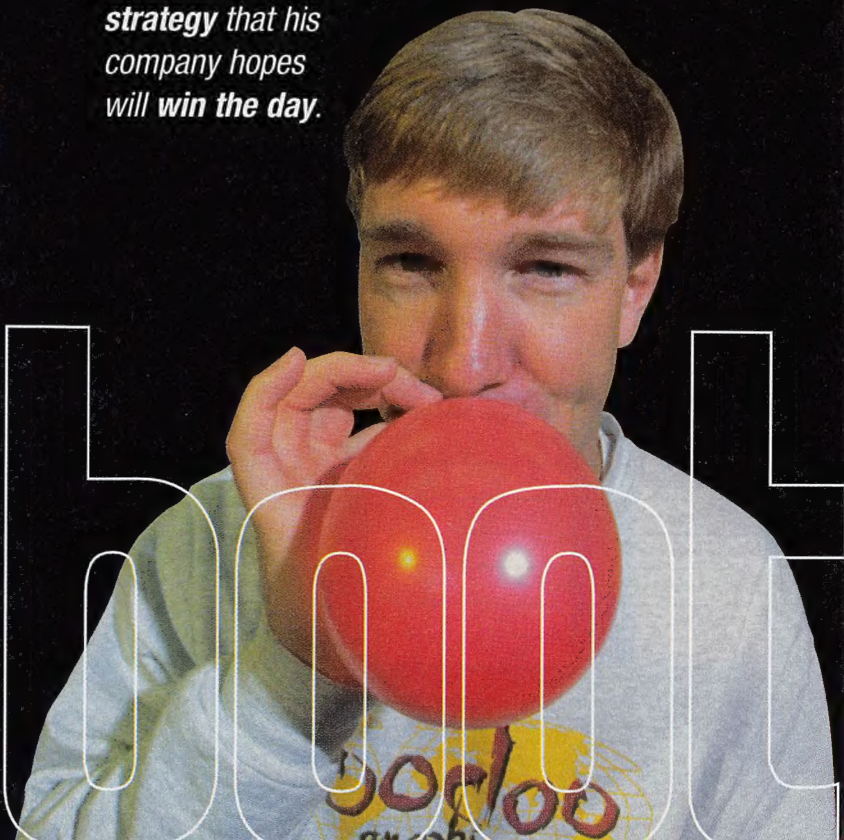
*Microsoft defector **Alex. St. John** reveals the truth behind Microsoft's **darkest** secrets: the war between **Direct3D** and **OpenGL**; the DirectAPIs that died on the vine; the ill-fated **Talisman** 3D chip. And what's up with that alien space ship designed by **H.R. Giger**?*

34 Lip: Scott Sellers

*The **3D card** API wars are **raging** and casualties are beginning to mount. Now a **renegade** unit of former SGI soldiers has emerged to **drop the bomb** on all contenders. **Scott Sellers—3Dfx's** VP of R&D—leaks the **strategy** that his company hopes will **win the day**.*

54 Must See PC

*Hey, you got computing in my **TV**! Hey, you got TV in my **computing**! Mmmm... TV. Mmmm... computing. This tastes good! Dig the whole big-screen PC/TV **convergence** with reviews of Gateway 2000's Destination, and Compaq's PC Theatre.*



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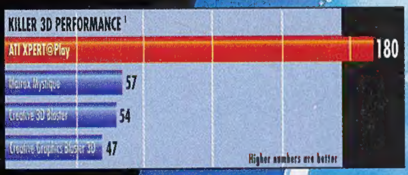

MORE FEATURES

FEATURE	XPERT@Play	Matrox Mystique	Diamond Monster 3D
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Alpha Blending/Fog	●		●
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DVD-Quality Video	●		
2D Acceleration (Win 95)	120M	103M	n/a

Product Information Number 85

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Now You See It.

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october 1997

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IMAGINE PUBLISHING INC
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INTERNATIONAL LICENSING REPRESENTATIVE
Robert J. Abramson and Associates, Inc.
720 Post Road, Scarsdale, NY 10583

volume 2, issue 9

boot *(ISSN 1088-5439) is published monthly by Imagine Publishing, Inc., 150 North Hill Drive, Suite 40, Brisbane, CA 94005, USA. Periodical class postage paid in Brisbane, CA and at additional mailing offices. Newsstand distribution is handled by Curtis Circulation Company. Basic subscription rates: one year (12 issues) U.S.* ***$39.90****/Canada* ***$53.90*** *Canadian price includes postage and GST (GST #128220688).* ***POSTMASTER*** *Send changes of address to* **boot***, P.O.Box 51479, Boulder, CO 80328-1479.*

Bulk Rate, U.S. Postage Paid,
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Standard Mail enclosed in the following editions: A3, B, B1, B2. CPC Int'l Pub Mail # 0781029. Outside the U.S. and Canada, price is $53.95, U.S. pre-paid funds only. For customer service, write **boot***, P.O. Box 51479, Boulder, CO 80328-1479;* **boot***, 150 North Hill Drive, Brisbane, CA 94005.*
Imagine Publishing also publishes PC Gamer, Next Generation, Mac Addict, Ultra Game Players, *and* PlayStation Magazine. *Entire contents copyright 1996, Imagine Publishing, Inc. All rights reserved. Reproduction in whole or in part is prohibited. Imagine Publishing, Inc. is not affiliated with the companies or products covered in* **boot***. PRODUCED IN THE UNITED STATES OF AMERICA.*

COMM PORT

The Fate of AMD & Cyrix

When I initially heard about AMD's K6 and Cyrix's 6x86MX processors, I thought that they had a chance to capture a portion of the Intel monopoly. However, after reading about Intel's price cuts in *boot* 12, I can't help but think that they are doomed to be insignificant players for the forseeable future.

The attempt by AMD and Cyrix to prolong the life of Socket 7 was admirable, but just as they have had to make Pentium clones, MMX clones, and will also clone AGP, they will have to clone Slot 1 as well. Neither company has the market clout to influence architectural trends.

Also, do you know if Windows 98 will support dual processors? With chip prices dropping daily, in 1Q 98 most people will be able to afford a dual-processor system.

Christopher Bradford

Hardware editor Andrew Sanchez replies: *Yes, both AMD and Cyrix are up poo-poo creek without a paddle. Intel's road map calls for Socket 7 Pentiums with MMX technology as its entry-level processor, with Pentium II (both Slot 1 and 2 varieties) controlling the majority of the market. AMD and Cyrix either have to gear up and fight back by providing a compelling and powerful processor at a competitive price, or die.*

Unfortunately, Windows 98 will not support dual processors. You'll have to get into NT4.0 now and wait for full DirectX support in NT5.0 By Q1 98, you'll be able to get into a dual P-II/Slot 1 situation easily—the 233MHz and 266MHz part will work it just fine.

While we **consumers** have **benefited** from AMD's and Cyrix's **efforts** in the form of **lower chip prices** across the board, they **cannot survive** by being a price motivator for **Intel** alone.

Serious Video

When do you review the real 3D cards? No, not these band-aid 1996 leftovers such as the Monster 3D with its paltry 640x480 resolution. Sure they do gaming, but since when has 3D belonged only to gaming? I'm talking about new cards! (At least one must be on the street, they advertise in *boot*!) I'm talking full-function 3D cards that do it all.

I'm talking one card, one PCI port, multi-everything, and Intel AGP ready to boot. Anybody and everybody can talk about what's been on the street for months. I'm a *boot* subscriber and I expect tomorrow today!

Anthony Famiglietti

Tech Editor Chris Dunphy replies: *We can only review what exists, and we're just as excited to get our hands on the boards you're drooling over as you are. As much as we'd like to break into the R&D labs and just take what we want, we have to wait to review a new board until the board maker deems it "ready" for prime-time. Right now we're playing with a beta STB Riva 128 board, and an almost-final ELSA Permedia 2-based speed demon. We've also just received a Jazz Adrenaline Rush board, and are expecting more goodies any day now. Look for full reviews off all these bad-ass speed demons soon. No magazine can compare to boot's 3D coverage.*

Spec666 Proposed

Most AMD, Cyrix, and Intel processors run their system bus at 66MHz (some at 60MHz, a few at 50MHz, and Cyrix has ones with 55MHz and 75MHz). Intel's "Deschutes" Pentium II will have a 100MHz system bus. Since Deschutes as well as the 440LX (UltraDMA + AGP) chipset have been pushed back well into '98, I think AMD and Cyrix should shoot for processors running a 83MHz system bus now. Heck, let's call it a standard: "Spec666"! (Assuming I'm coining the phrase/term/word first).

Why? Because a 66.6MHz system bus x 8 Bytes (64-bit) equals 533MB/sec theoretical transfer rate (to three significant digits). Running at 83.3MHz x 8 Bytes equals 666MB/sec TTR (And the proposed Deschutes will have a 100MHz x 8 Bytes equals 800MB/sec TTR). Running the system bus at 83.3MHz improves memory, I/O and, in most cases, PCI card throughput as well. It has been proven quite stable (with tweaking and good components) without the cost of Dechutes.

Starting with AMD and Cyrix (as well as IDT, SGS-Thompson, etc...) processors running a system bus at 83.3MHz, we could move on to Spec666-approved/certified main/motherboards (and MB chipsets), cases/fans (fan/heatsinks), memory and even PCI cards (able to run at 41.6MHz—although a few 83.3MHz-capable mainboards out there can run the PCI at system/2.5 instead of system/2.0 for standard 33MHz). Since AGP is either at 1x (66.6MHz) or the 2x (133MHz), I suggest a new "1.25x" (83.3MHz) would be much easier than the (impossible? expensive?) 133MHz, but 25% faster than 66.6MHz.

I've seen many users running AMD K6-200 (normally 66.6MHz x 3) at 208MHz (83.3MHz x 2.5) and K6-233 (normally 66.6MHz x 3.5) at 250MHz (83.3MHz x 3) and seeing benchmarks faster than the Pentium II (with exception of the 300MHz version). Now this, according to AMD, obviously invalidates the chip's warranty, but I've even heard a rumor that AMD has designed a K6 to run cool at 83.3 MHz x 3 equaling 250 MHz. Cyrix probably has similar plans with a 6x86MX-250 or 266.

With my proposed Spec666, the Pentium clones have a real shot at showing who's leading who.

Bryan J. Smith

Disc Editor (and resident overclocking freak) Sean Cleveland replies: *It's a good idea, both in the interim and in the long run. You talk about the 83MHz bus speed on new motherboards that would help system throughput now, and also the new 1.25 multiplier for AGP which would help when that is finally released.*

Hardware Junkie Seeks Fix

I'm an application programmer by trade and a hardware junky by habit and hobby. (Picture a crack junkie who has gone too long without a fix and has the shakes really bad... that's me waiting for the next edition of *boot*.) I am waiting 'til March to upgrade my P133 system. I know that's some time away but I have been browsing several hardware web sites and have the following questions:

1) Whatever happened to the NLX form factor?

2) What exactly is the benefit of the Pentium II over other systems with the same clock speed? Several web sites have published bench results where P-IIs, P-MMX, and P-Pros have all had very similar bench results on systems with the same clock speed and the same components. AGP was supposed to be one of the benefits, but AMD is already working on a Socket 7 board that will support AGP with greater FPU power. Granted P-Pro's are slower on 16-bit apps but with *Duke Nukem* going to the *Quake* platform, who cares?

3) When are we going to see some *real* DVD apps/games?

4) My understanding of 3D cards is that the existing cards and the next generation of cards will not benefit from AGP. The cards have to be built with AGP in mind to benefit from the faster bus. Is this correct? Is there a Voodoo in the works for AGP?

Again, great mag. *boot* 11 was fantastic and worth my entire subscription in info on 3D cards!

Brady Stephenson

Hardware Editor Andrew Sanchez replies: *Zoinks! Let's see if we can tackle these questions one-by-one...*

1) The NLX form-factor is alive and well. At a recent June Computex International Computer Show in Taiwan, vendors were showing off their new cases and motherboards designed around the NLX form-factor. Major board vendors like FIC, Intel, Tyan, I-Will, Asustek, and others are promising boards based off the design, so they are forthcoming. When will they make it here stateside? It's really up to the manufacturers, but we guess it'll be real soon.

2) Current Pentium II processors do offer speed increases, depending on the application. The problem with Socket 7 AGP is that you're still going to encounter bottlenecks—specifically with L2 cache speeds. The P-II's L2 cache runs at half the core CPU speed, and the Slot 2 Deschutes will run at full speed, like the Pentium Pro. Socket 7 L2 cache will run as slow as ever. As far as AMD coming out with a CPU with greater FPU power, we'll believe it when we benchmark it, and by the time AMD catches up to what's considered acceptable performance, Intel's will be already working on faster CPUs.

So, when you benchmark similar-speed systems, check what benchmarks they're running.

3) You don't find the Playboy DVD disc compelling?!? Seriously, we're asking the same question. The boot *editors that went to E3 couldn't find any compelling DVD games. Even stuff like* Wing Commander Prophecy *will ship on three CD-ROMs, as will many of this year's holiday titles. We'll keep you posted on any earth-shattering DVD content as it happens.*

4) Yes. AGP is a completely new expansion slot that sits alongside your PCI and ISA slots. Currently, AGP will come out as a single slot solution (either as a slot or as an integrated video solution...but not both.) Cards will have to have an AGP bus in order to take advantage of its power.

As far as 3Dfx's Voodoo, they've told us that their next-generation Banshee part will be their first AGP part, but that's not going to see the light of day til late next year (if you're lucky). As of right now, Voodoo 2 will most likely be a PCI solution, for some interesting reasons that you'll find out about soon enough.

> *My understanding of* ***3D cards*** *is that the* ***existing cards*** *and the* ***next generation*** *of cards* ***will not benefit*** *from* ***AGP****.*

NT Disc Syndrome

When are you going to make your *bootDisc* compatible with Windows NT 4.0? I love your magazine, but I can't enjoy the disc.

Cynthia V. Penyak

Disc Editor Sean Cleveland replies: *The* bootDisc *is NT compatible now! The new interface has been completely rewritten with* Director 6.0, *which now works with systems running* NT 4.0. *Luddites still running Win3.x still have their own EXE.*

Look for an impending redesign of the ripping bootDisc *interface coming soon.*

Matrox Replies

After reading *boot* 12, I felt compelled to contact you concerning *boot*'s review of our product, Matrox Rainbow Runner.

First and foremost, it seems essential to explain that the Mystique 220 is an all-in-one solution offering 2D/3D and video acceleration to the mainstream business and home PC users. Although Mystique was not designed to be a gaming-only solution, it does offer what Matrox feels is a gamer's number-one priority—fast frame rates and solid Direct3D support. Based on the comments at boot's own website, readers agree that Mystique is a great all-around solution: "The Matrox Mystique 8MB model can do all that was asked... I don't know why the Mystique is dissed so much, with hardly much evidence toward it being a bad vid card."

Furthermore, the Rainbow Runner portion of the review provides only a cursory view of the product's capabilities. With the Mystique or Mystique 220/Rainbow Runner combination, end-users can access a complete set of video applications including hardware MJPEG video editing, capture of still images or video stream, TV-out and a TV Tuner option. Over $500 worth of software is bundled. The reviewer also missed an important aspect of the product—Matrox's own user-friendly PC-VCR Remote software interface.

Also, Matrox does not expect end-users to replace their monitor with a TV. A monitor offers much sharper and non-interlaced display while a TV, based on the NTSC standard, offers a maximum resolution 720x480 with interlaced refresh. The out-to-TV feature is useful for playing back your "just-created video" or for playing PC games on the big screen. The Rainbow Runner out-to-TV functionality supports 640x480—the resolution most often used in games. Higher resolutions are not supported because the TV itself cannot read above the NTSC specification. It is impossible to continually run Windows-based applications on a TV. For $400 users can have a 4MB Mystique 220, Rainbow Runner Studio, and Rainbow Runner TV, turning their PC into a complete entertainment unit.

3D gaming may be the hype at the moment, but hardware video functionality offers capabilities to a much broader and diversified audience. In the future, as Matrox continues to introduce products that offer never-seen-before functionality, I look forward to boot's comprehensive reviews that provide readers with a complete picture.

Nathalie Benoit, Matrox Graphics Inc.

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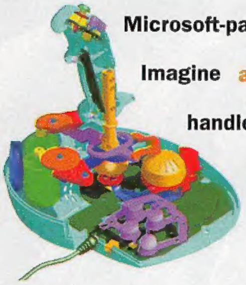
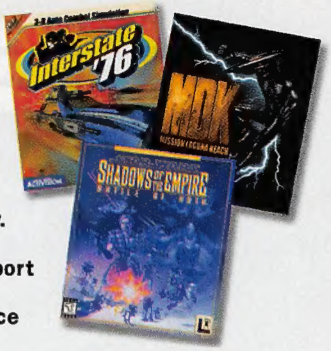
Force feedback adds the sense of touch to supported games so you can actually feel the game. But a force feedback joystick isn't worth a dusty Pong if the stick is pulling processing power from your computer and slowing down your game. That's why the Microsoft® SideWinder® Force Feedback Pro has a 25MHz 16-bit "force co-processor" that does all the force computation on the stick. Which means your computer feels nothing, and your games are never slowed down. Force Feedback Pro is as much as six times faster than other force sticks. So you'll see and feel every Uzi recoil, every stall on take-off from O'Hare, and every nine-iron you shank to the left.

There's also real rocket-science stuff inside the Force Feedback Pro. Like Microsoft-patented digital-optical technology. Imagine a tiny infrared camera that detects handle and throttle motion to within one-hundredth of a degree without any wear or calibration.





The stick is also easily customizable, so in just a few seconds you can program each button the way you like to play. And forget port hogging. Force Feedback Pro has only one computer cable and plugs into your gameport.

Plus, you can test all these features right away with the three killer games included in the box: Interstate '76,™ Star Wars® Shadows of the Empire:™ Battle of Hoth,™ and MDK: Mission Laguna Beach.™ The Microsoft SideWinder Force Feedback Pro. It's designed so that everything in your game will be felt. But only by you.

For more information (yes, believe it or not, there is more), go to www.microsoft.com/sidewinder

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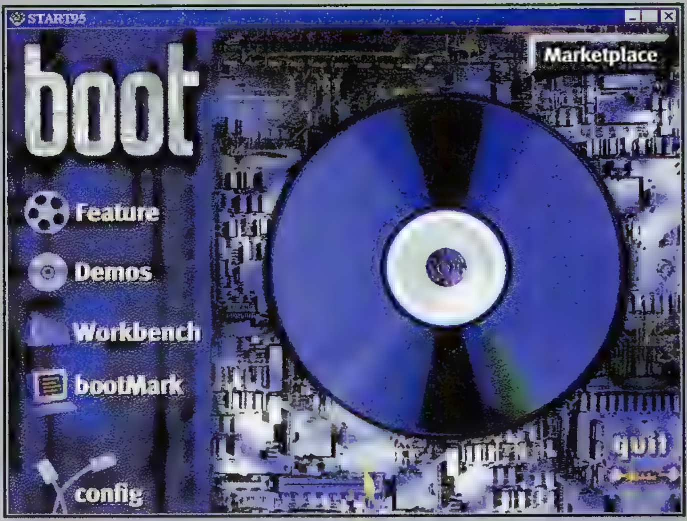
MMX™ intel inside® pentium® II PROCESSOR

Product Information Number 103

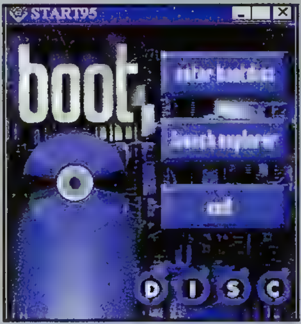

START95
boot
Marketplace
Feature
Demos
Workbench
bootMark
quit
config

The bootDisc is compatible with Windows 3.1x, Windows 95, and Windows NT versions 3.51 and 4.0.

TRY IT ON THE DISC

Launching from Windows 3.1x: Launch the File Manager, click on your CD-ROM drive letter and then double-click the Start31.exe file.

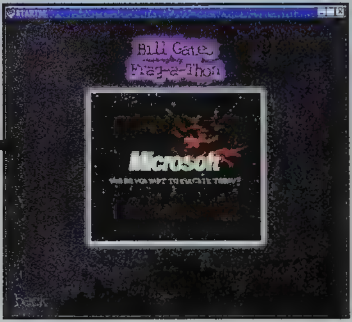
Launching from Windows 95 and NT: To use the bootDisc, place the disc in your CD-ROM drive and a menu will pop up. You will have the option of entering or launching the Explorer to view the contents. If it doesn't pop up, open your Explorer via the Start button, click on your CD-ROM drive letter and then double-click the Start95.exe file.


START95
boot
enter bootdisc
launch explorer
exit
D I S C

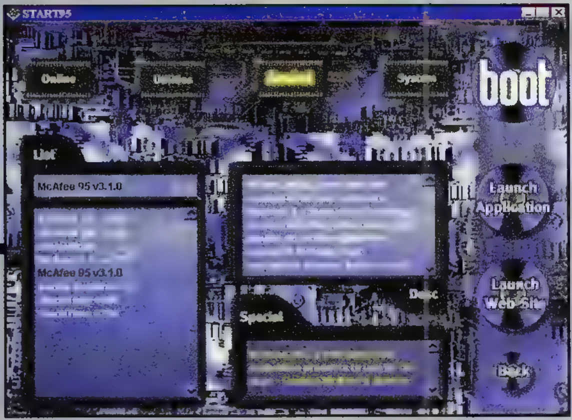
ON **THIS MONTH'S** DISC:

the Direct X FILES
Back

The DirectX Files: *Former Microsoft gaming evangelist Alex St. John may have defected from the empire but the DirectX APIs live on! We're up to version 5.0, folks, and hopefully these drivers will be simpatico with your ripping new hardware.*


Bill Gates Frag-a-Thon
Microsoft
Back

Bill Gates Frag-a-Thon: *Ever have a chilling nightmare about Bill Gates chasing you through an underground catacomb with a gun? Well start sweating, Skippy! Our "inside sources" at Microsoft have provided us with a top-secret AVI of the disturbing phantasm. Dig the terror and don't be scared! It's only a movie!*


START95
Online
Utilities
Special
System
boot
List
McAfee 95 v3.1.0
McAfee 95 v3.1.0
Desc
Special
Launch Application
Launch Web Site
Back

Look here to find the coolest new apps and most needed utilities. This month's bootDisc contains:

Application	Publisher	Web URL
Online Browsers and Applications		
Internet Explorer 3.02 for Win95/NT	Microsoft	microsoft.com/ie/
Internet Explorer 3.02a for Win3.1x	Microsoft	www.microsoft.com/ie/
QuickTime Plugin	Apple	www.quicktime.apple.com
WinGate	Deerfield Comm.	www.wingate.net/
WinProxy	Ositis Software	www.winproxy.com/
Applications needed for Survival		
Acrobat 3.0 for Win3.1x	adobe	www.adobe.com/prodindex/acrobat/readstep.html
Acrobat 3.0 for Win95/NT	adobe	www.adobe.com/prodindex/acrobat/readstep.html
ActiveMovie	Microsoft	www.microsoft.com/ie/download/
McAfee 3.1x v3.1.0	McAfee	www.mcafee.com/
McAfee 95 v3.1.0	McAfee	www.mcafee.com/
Norton Antivirus 95	Symantec	www.symantec.com/nav/fs_nav9520.html
QuickTime for Win3.1x	Apple	www.quicktime.apple.com/
QuickTime for Win95/NT	Apple	www.quicktime.apple.com/
System Applications and Utilities		
ARJ Shell	H. Fischer	ourworld.compuserve.com/homepages/Harald_Fischer/
DirectX 5.0	Microsoft Corporation	www.microsoft.com/directx/default.asp
MFC 4.2 Runtime Files	Wedge Software	www.wedgesoftware.com
Visual Basic Runtime	Sausage Software	www.sausage.com/soft1.htm
Win RAR	Internet Pro's Network	www.inetpros.net/rar.htm
ZipMan	Helix	www.helixsoftware.com/nuts&bolts.html
General Utilities		
Font Smoother	Microsoft	www.microsoft.com/truetype/grayscal/smoother.htm
Norton Utilities	Symantec	www.symantec.com/nu/
QuickView	Inso	www.inso.com/frames/product/product.htm
QwinSafe	Hyper!-Q Software	ourworld.compuserve.com/homepages/hyper/
SciTech Display Doctor	SciTech	www.scitechsoft.com/index.html
VT Rescue 95	VT Virtual	www.vtvirtual.com

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Product Information Number 101

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TRY IT ON THE DISC

CONSTRUCTOR

Constructor takes the empire building and resource management of the best simulations and adds a strong dose of character interaction, humor, and strategic competition. Take the role of a real-estate developer in a race to build up and manage resources, properties, environments, and human interaction, while trying to outperform and destroy rival development firms. With up to 4 player game play on a network or head-to-head modem action.
Requirements: DOS, Windows 3.1x or Windows 95, a 486/66MHz with 8MB of RAM and 61MB of hard disk space. This is a fully playable demo with a 20-minute time limit. From Acclaim.
Location on the Disc: Cnstrctr\Setup.exe
URL: www.acclaimnation.com/constructor/
Not reviewed in this issue.

DARK COLONY

Dark Colony is a futuristic real-time strategy game based on a war between a gray alien race and humans over the planet Mars. Choose between the gray's superior genetic technology and the human's advanced robotics and cybernetics. It features realistic destruction—massive fiery explosions sends units rolling, disintegrating and even dissolving! It uses lighting effects and the Shadow detail and special effects are greatly enhanced - lending to the day and night phases of the game. Up to 8 players can wage tactical warfare via modem, network or online play with over 40 missions.
Requirements: Windows 95, a 90MHz Pentium with 16MB of RAM and 43MB of hard disk space. This is just a preview demonstration of Dark Colony. More features will be included in the full release of game, such as: multi-player games, a full-featured Editor, indigenous creatures, underground and jungle levels and ancient alien Artifacts. From SSI.
Location on the Disc: DrkColny\Setup.exe
URL: www.darkcolony.com/
Not reviewed in this issue.

Fallout is set in the aftermath of a worldwide nuclear war. You take the role of a Vault-dweller, a person who has grown up in a secluded, underground survival Vault. Circumstances arise that force you to go outside. It is a world of mutants, radiation, gangs and violence. The core of the game revolves around your character. The character creation system allows you to make unique characters and a skill-based system allows you to fine-tune it. Combat in Fallout is tactical turn-based, allowing you to take as much time as you need to make decisions. Weapons include shotguns, flame-throwers, chain-guns, rocket launchers, sledgehammers, brass knuckles and more.
Requirements: DOS, Windows 3.1x or Windows 95, DirectX 3.a or higher, a 90MHz Pentium with 16MB of RAM and 45MB of hard disk space. This is a fully interactive demo with some features either missing or inactive. From Interplay.
Location on the Disc: Fallout\Setup.exe
URL: www.interplay.com/fallout/
Not reviewed in this issue.

SoftQuad
HoT MetaL PRO 3.0

HoTMetaL PRO 3.0 with site management tools will give you a taste of what *HoTMetaL Pro 4.0* offers. With the Information Manger's high-level Cyberbolic overview or detailed tree-structure, you can quickly visualize your entire Web site, pinpointing broken links or orphaned files, and move files around your site without corrupting links in the process. You can also perform context-sensitive searches across groups of documents. Creating cascading style sheets ensures that your documents display as you intend. With batch conversion capabilities, you can convert existing word processing documents into HTML, either individually or in groups, and publish them with one keystroke to single or multiple servers.
Requirements: Windows 95, a 486/33MHz with 8MB of RAM and 15MB of hard disk space. This is an evaluation version that is good for 30 days. From SoftQuad.
Location on the Disc: HotMetal\Setup.exe
URL: www.sq.com/products/hotmetal/hmp-org.htm
See the review on page 92.

Enter *OutPost2*. They were the last survivors of a dead Earth. For nearly a century they drifted, suspended in cold sleep, while computer intelligence guided their hastily built starship and searched, unsuccessfully, for an Earth-like world. Their voyage ended on a world they named New Terra, in the same spirit that desert dwellers once named their towns after sources of water. In truth, it was nothing like Earth; stark, hostile, forbidding, and in its own way, beautiful. There the last few hundred surviving humans cobbled together a town from their meager supplies and what they could salvage from their starship and landers. At first the colony was known only as "Outpost," but as it grew, the colonists gave it a real name. They called it Eden... *Outpost2* is a real-time strategy/action/city-building game for strategy gamers. Play as the leader of the original colony, Eden, or the rebellious splinter colony, Plymouth.
Requirements: Windows 95, a 60MHz Pentium with 16MB of RAM and 34MB of hard disk space. NOTE: This version of the *Outpost2* demo will not work with the Cyrix chip. The final product will. From Sierra.
Location on the Disc: Outpost2\Setup.exe
URL: www.sierra.com/titles/outpost2/site/
Not reviewed in this issue.

PANZER II GENERAL

In *Panzer General II*, witness the Living Battlefield, a new type of strategy game artwork. Featuring the heightened realism of hand-rendered maps—thirty battlefields that are faithful to the real ones of WWII—the Living Battlefield also showcases detailed rendered combat units. The second generation Panzer General game engine allows you to wage battle through WWII's Eastern and Western Fronts, North Africa, even the continental USA. You can fight as a Wehrmacht Officer, or lead your comrades in the Soviet Army. You can hit the beaches at Salerno and Normandy as an American or British General. The successful "Panzer General" devises sound strategic plans, and carries them out with unswerving commitment. It also includes Multiplayer support for up to 4 players via LAN or the Internet—plus PBEM support.
Requirements: Windows 95, a 90MHz Pentium with 16MB of RAM and 40MB of hard disk space. This is a half turn scenario. You are in command of the German (gray) units. To win, you must move a German unit into each of the city hexes that contain a flag. From SSI.
Location on the Disc: PanzerII\Setup.exe
URL: www.panzergeneral.com/
Not reviewed in this issue.

SYMANTEC.
VisualPage

Visual Page 1.0 helps make it easy to create a web page. This tool has a familiar look and feel of current word processor applications to get new users started quickly. Experienced users will appreciate the highly interactive environment to help make web pages quickly and accurately. With the final version of *Visual Page*, you get sample templates to begin creating professional looking documents quickly. This lets you concentrate on the important content instead of spending time on formatting a web page. The easy-to-use toolbar has easy to use features to change typeface sizes, align text and set styles—common to many word processors. Setting up document links is a snap with the Site Window. You just drag and drop files and anchor points to set up the links. No more opening other web pages to try to link them. Since web pages are recognized cross-platform, web pages developed on a Mac can be put on a Windows or Macintosh web server.
Requirements: Windows 95, a 486/66MHz with 8MB of RAM and 12MB of hard disk space. This is a fully working evaluation version that expires in 30 days. From Symantec.
Location on the Disc: Visual.Pge\Setup.exe
URL: www.symantec.com/
See the review on page 92.

XCAR
EXPERIMENTAL RACING
3Dfx Version

Welcome to *XCar: Experimental Racing and XCar: Experimental Racing 3Dfx* where you race prototype super-cars. Race teams and component manufacturers are very tight-lipped about their advancements. In *XCar*, the player is able to construct a car and then see how it performs on the track. *XCar* is a simulation of "unlimited racing". The only laws that apply are the laws of physics and your knowledge, skill, and determination. Select from a revolutionary collection of hi-tech, race-bred automobiles. Customize your machine from a host of the most advanced racing components. Test your vehicles on the high-speed oval, skid pad, or handling track, then use the telemetry data to optimize your car's performance in preparation for qualifying. Enter the race circuit or compete against your friends over a modem or network.
Requirements: DOS, Windows 3.1x or Windows 95, a 486/66MHz CPU with 16MB of RAM and 18MB of hard disk space. Demo allows you to race four different cars on two different tracks along with modification capabilities. NOTE: The 3Dfx demo is not compatible with the Voodoo Rush. From Bethesda.
Location on the Disc: XCar\Setup.exe
URL: www.xcar.com/
See the review on page 88.

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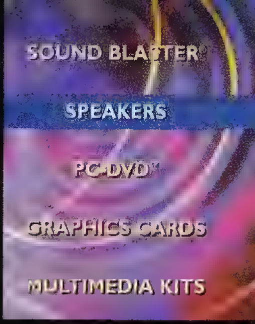
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> *— Stereo Review*

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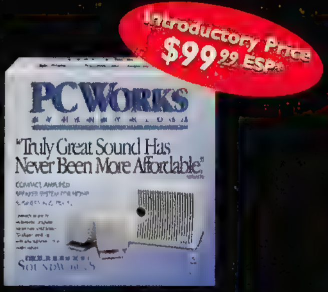
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- PC Gamer

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"I Assumed That They Were Powered By Testosterone Rather Than Electricity."
-PC World

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Product Information Number 102

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ESRB
ZONE

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Bombardier Business Aircraft

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Microsoft
Microsoft
Flight Simulator 98

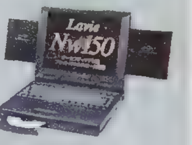
Look here ace, you've got just 90 feet of runway before you earn your wings the hard way. Face it. Your fixed-wing rules do not apply here. What you need is a helicopter. And now you've got one in Microsoft® Flight Simulator 98, the most significant upgrade of this product ever. With it you'll soar over painstakingly detailed landscapes that include 3000 airports (10 times more than the previous version) and more than 45 cities around the world. Flight Simulator 98 supports multiplayer and force feedback technology so you can achieve all new levels of flight realism. Take control of the widest range of aircraft, including this Bell 206B JetRanger III helicopter, a machine that's guaranteed to make you feel like a rookie all over again.

Your coordinates for take-off are www.microsoft.com/games/fsim

respective owners

NUGGETS

Flat Panel Speakers Debut on New NEC Notebook



Using a 0.5mm thick sheet of rare carbon material, these new lightweight flat-panel speakers implement a vibration board that can be tucked behind a notebook's LCD screen. These unique speakers are 140mm by 123mm and promise twice the volume of normal notebooks while generating high-fidelity sound traditionally associated with conventional speakers, and certainly not the infamous solutions found on most notebook PCs.

Bass frequencies as low as 200Hz can pump through the revolutionary design, as opposed to the 500Hz lows from conventional speakers. And all this performance doesn't require any additional juice from the notebook's battery, either.

NEC's 150MHz MMX-based notebook that will debut the technology comes with a 12.1-inch screen, 16x CD-ROM drive, 2GB hard drive, and will sell for under $5,000. But order yours quick; NEC is limiting the initial run to 2,000.

More products incorporating the flat-panel technology are expected in the fall, as manufacturing techniques and materials come together.

Be And Intel Do The Tango

Be
OS
entium II
processor

Be stunned attendees of its Be Developers Conference in Boston by demonstrating the BeOS running on a dual-processor Pentium system. Adding to the astonishment was Be's announcement that the next major release of the BeOS (currently slated for January 1998) will co-exist on both the Intel and PowerPC platforms. Be demonstrated compatibility by showing software compiled from the same source code running identically on both platforms.

Intel itself played no small role in facilitating the port. Erich Ringewald, chief technology officer of Be said, "Our ability to move the BeOS to the Intel processor architecture has been further enhanced by the encouragement and assistance of the folks at Intel. Working with them has been an excellent experience and we look forward to further collaboration in the future."

Be revealed it already has a quad-Pentium powered BeOS system up and running in their lab.

> 17

Forget Retail, Buy Direct

Companies Pumping Build-To-Order Paradigms

The days of heading down to your local computer store to purchase a PC are long gone. These days, you can have a new PC delivered right to your front door. Thanks to the successes of such mail-order stalwarts as Gateway 2000, Micron, and Dell, other PC manufacturers—including Compaq and Packard Bell NEC—have now adopted direct or build-to-order sales models in the hopes of dominating the arena. Although the success of this strategy remains up in the air, one thing is certain: all this direct competition will ultimately lead to lower prices for the consumer, and hopefully, even better machines.

The motivation for going direct is easy: cost. Keeping inventory in the retail channel amounts to a huge cash outlay. By eliminating the amount of finished goods collecting dust in warehouses across the country, companies can reduce their overall expenditures, and eliminate price protection for retailers. For example, say Compaq builds a new 500MHz PC using a processor that costs $1,000. The total cost to you, the consumer, would of course be much higher, due to profit margins and the like.

With major companies such as Compaq and Packard Bell NEC selling direct, the days of dealing with clueless sales clerks in your local computer store may finally be over.

SGI Uses The Force—A New Star Wars Adventure

[curtain up]
[lights down]
[cue titles]
[cue John Williams' music]

In a galaxy not so far, far away…

All hope seemed lost for OpenGL ever since the evil Empire deemed it unworthy for entertainment applications. The rebels were on the run, until a hero arose from the deserts of Texas to rally the troops and bring about a huge victory with the power of GLQuake. With developer support rallying, it seemed as if OpenGL might be able to co-exist in the galaxy alongside Direct3D.

But then the Empire stuck back, halting work on MCD (mini client driver) support within Windows 95. This made it all but impossible for rebel hardware accelerators to speed OpenGL without doing a full and expensive ICD (installable client driver) implementation themselves. Despair abounded.

But at a special gathering called SIGGRAPH, citizens witnessed the return of the SGI Rebellion. SGI created OpenGL, but until now, have all but ignored its potential to serve as an API across a wider spectrum of applications. Focused on the high-end market, but with threat of the Empire upon them, the Rebellion realized counter measures were drastically needed.

To strike a blow against the Empire, SGI announced it will provide the source code and low level interface to their library

Everyone takes a big chunk of the pie—the manufacturer ups his price to the distributor who ups his price to the retailer, and so on, leaving "you know who" to absorb most of these profit margins. It's a vicious cycle. A direct model however, cuts out all middlemen, ultimately lowering the cost of the product to the consumer, with companies still able to retain an acceptable profit margin.

A bigger problem is time, or lack of. Companies must determine what consumers will want three, six, or even twelve months down the road, and plan accordingly. Compaq refreshes its product lines quarterly, but due to the manufacturing process, their decisions on components, case design, and technologies must be made upwards of six to twelve months in advance. Having to decide what consumers will want for Christmas 1998 is a risky guessing game, and a game most companies unfortunately lose. Mail order companies such as Gateway 2000 don't have such restrictions, and are flexible to accommodate newer technologies faster and more efficiently. That's why early adopters gravitate towards mail-order—you can get what you want, and you can get it now.

There is one caveat however—service and support. Top PC manufacturers (and retailers) offer buffed service and support programs, and there is some speculation that selling direct will somehow minimize or reduce the level of support. But refuting this hypothesis is the recent study placing mail-order maven Gateway 2000 at the top of the list for consumer loyalty, beating out all other U.S. PC vendors.

To combat such perceptions, companies are even offering special installation or service programs.

"We are offering our customers... direct choice and reseller expertise on installation and support," said Luis F. Machuca, executive vice-president of Packard Bell NEC, discussing plans to introduce its new direct sales model, dubbed NEC Now, later this year. With the NEC Now model, customers can purchase systems directly, but can also integrate service and support from authorized Packard Bell NEC resellers if so desired.

According to a Compaq press release, its Build-to-Order model—which will be rolled out worldwide at the end of the year—will facilitate many customer benefits, including greater product availability and significantly lower product costs.

"The new model will shape the way all Compaq products are built, configured, purchased, and upgraded," said Compaq President and CEO Eckhard Pfeiffer.

But the direct model madness isn't restricted to just PC manufacturers. Retail giant, CompUSA, has announced it will be launching a full line of desktop PCs—aptly named the CompUSA PC—early this fall. Initial product specifications were not available at press time, however, consumers will be able to custom-configure the systems online (via CompUSA's web site) or over the phone. CompUSA plans on providing technical support and service through its own nationwide network of stores.

In this latest saga, Rebel forces led by a BFG 9000 wielding John Carmack storm the Empire demanding Lord Gates acknowledge OpenGL.

assisting all board makers in providing OpenGL acceleration. To help rally public and developer support, SGI will be launching a marketing blitz promoting OpenGL as the superior API for everything from games to CAD.

The Rebellion is seeking a truce with the Empire, in the hopes of living long enough to see OpenGL become officially sanctioned for games and Windows 95, perhaps as DirectGL. By making hardware acceleration possible and application development practical, the behemoth Empire of the north will have to give in to public pressure by acknowledging the Rebellion and accepting some of their demands.

The SGI version of OpenGL for Windows95 and NT is available for download immediately at coordinates www.sgi.com/technology/opengl/ or at www.opengl.org.

NUGGETS

Iomega Accused Of Consumer Fraud

Irate consumers have filed a class-action lawsuit against Iomega, the removable-storage company of not providing adequate technical support and not honoring product warranties.

The lawsuit was filed earlier this month in Delaware Chancery Court on behalf of the estimated 5 million consumers who have bought Iomega's computer data-storage products.

The suit claims the packaging for Iomega's Zip, Jaz, and Ditto drives "falsely and deceptively imply these drives are easy to use and that Iomega will provide support without charge to assist users with any questions or problems." However, like Compaq (which recently rescinded its policy), Iomega was charging consumers almost $20 for technical support assistance.

The class is asking for injunctive relief and for a reimbursement of any monies paid for receiving technical support.

This isn't Iomega's first brush with disgruntled consumers. Earlier this year, Iomega was named in a class-action complaint accusing the company of failing to deliver promised rebates on Zip drives and disks.

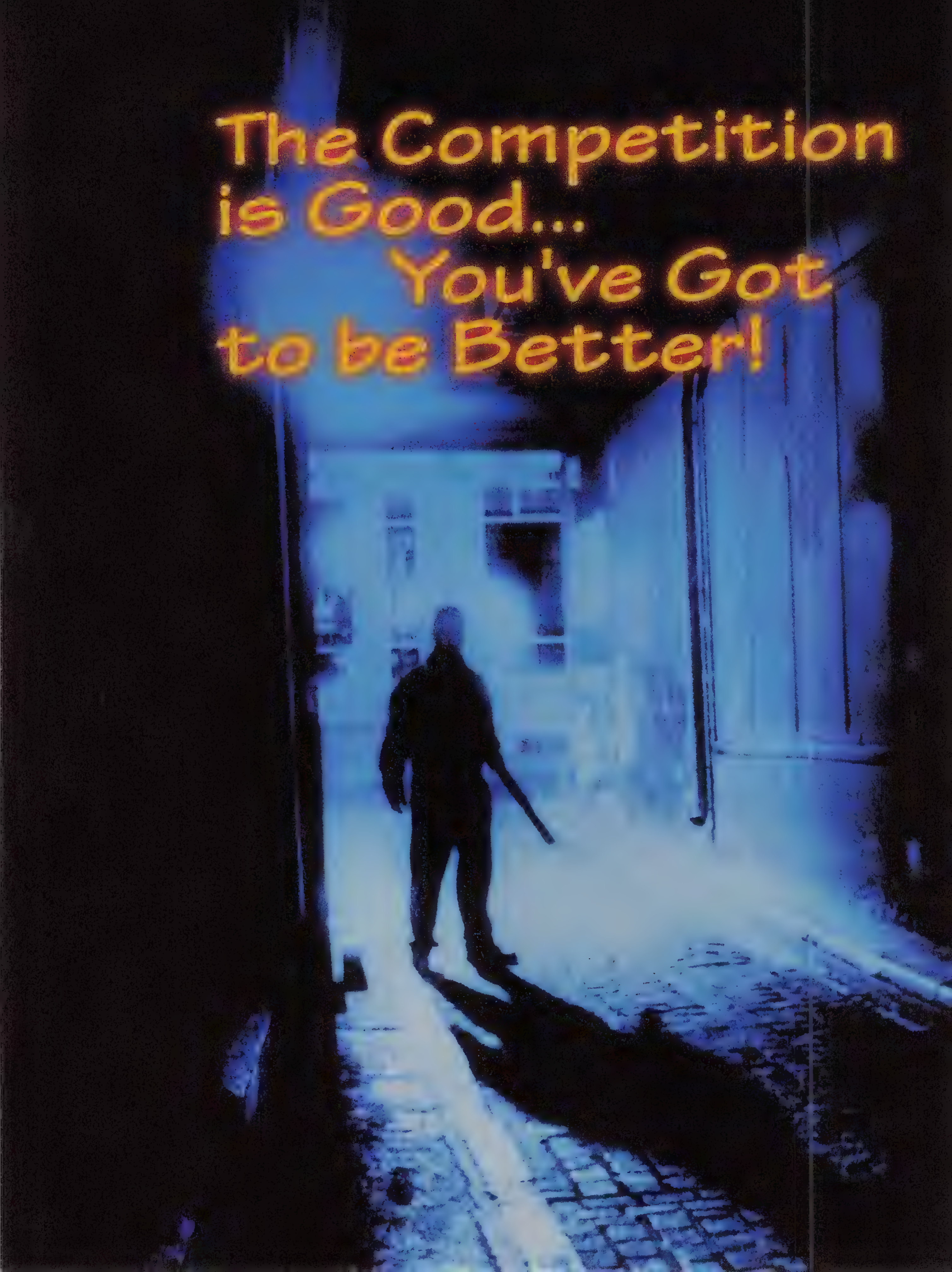
In related news, Iomega announced it has filed a patent infringement lawsuit against Syquest, accusing the company of pilfering patented designs and technology from its Jaz and Zip drives. Iomega is seeking injunctive relief against Syquest as well as monetary damages.

Intel's AGP VxD Kills Need For Memphis... For Now

With the addition of a Virtual Device driver (VxD), Intel promises its Accelerated Graphics Port will work with systems today—without the need for Windows 98 (the OS formerly known as Memphis).

The Intel-developed VxD will hook into Win95—but you'll need version OSR 2.1 to do it. But since system manufacturers are the sole provider of this latest incarnation, you won't be able to run down to your local computer store and pick up a copy. The only way to get your hands on a copy would be to purchase a brand-spanking new machine.

Once motherboard manufacturers release boards based on the 440LX PCIset, you'll be able to fire up AGP in any of its speed incarnations (1x, 2x, and 4x). But whether this VxD will work with non-Intel PCIsets that claim AGP compatibility, such as AMD and VIA, has yet to be determined.


The Competition is Good...
You've Got to be Better!

Meet Intergraph's Intense 3D™ Voodoo™ 6MB 2D/3D Graphics Accelerator.

It's the fastest, most full-featured 3D game accelerator. And with 3Dfx Interactive's Voodoo Rush technology, Intense 3D Voodoo delivers everything you want in a graphics accelerator... super 3D acceleration, 2D acceleration, DVD support, NTSC and PAL output to television...and more!

Enhances More Games.

Widely supported among game developers, 3Dfx technology has become the popular standard. In fact, more than 150 new 3Dfx supported games are expected to be available by the end of the year!

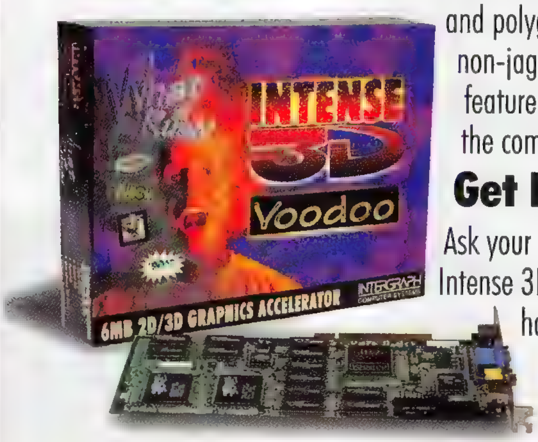
Includes full versions of three popular games

Highest Performance.

Just check out the performance chart below. The Intense 3D Voodoo accelerator with its 3Dfx Voodoo Rush chipset and 6MB of RAM trashes the competition. And you shouldn't play with trash.

The Most Complete Feature Set.

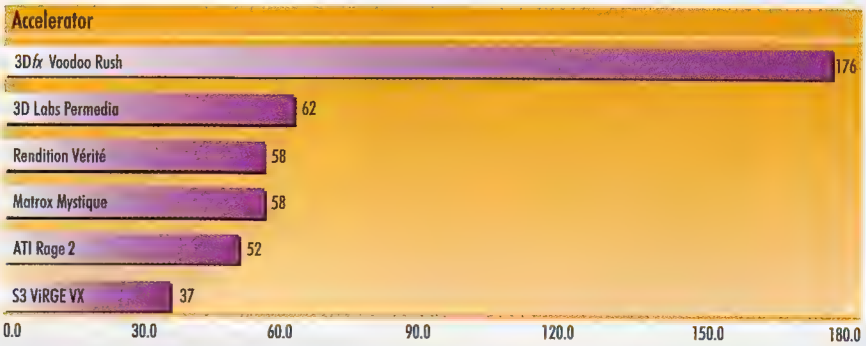
Features make the game...like tri-linear texture filtering for added detail and depth; per pixel special effects for more realistic screen rendering; and point, line and polygon anti-aliasing for the smoothest non-jagged images. The Intense 3D Voodoo feature set is the standard to beat – and the competition doesn't come close.



Get Intense!

Ask your local computer retailer for the Intense 3D Voodoo accelerator. It's a must have if you want to win the game!

INTERGRAPH
COMPUTER SYSTEMS



Windows 95 performance tests conducted by 3Dfx Interactive, Inc. using Ziff-Davis® 3D WinBench® 97 on a Dell Dimension XPS H266 with an Intel Pentium II 266MHz MMX CPU, 512K RAM cache, 64 MB EDO DRAM, 3.2 GB EIDE hard disk, and 256Kb disk cache.

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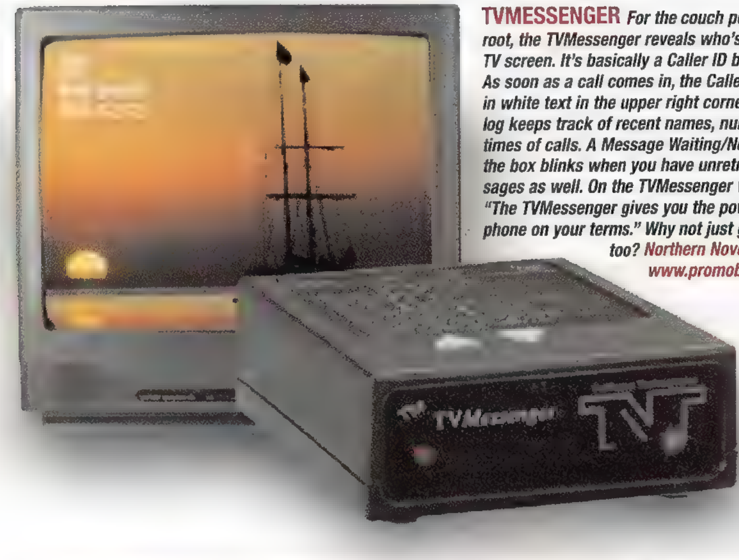
Product Information Number 184

PURE LUST

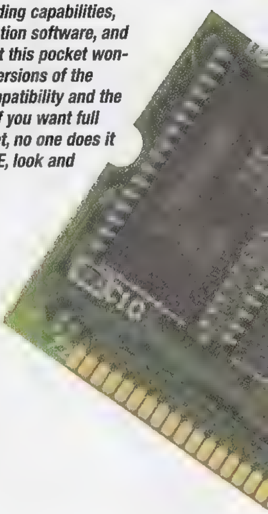
HIGH-TECH **TOYS** AND **TOOLS** WITH THE **RIGHT STUFF**

COMPILED BY DAVID PESCOVITZ



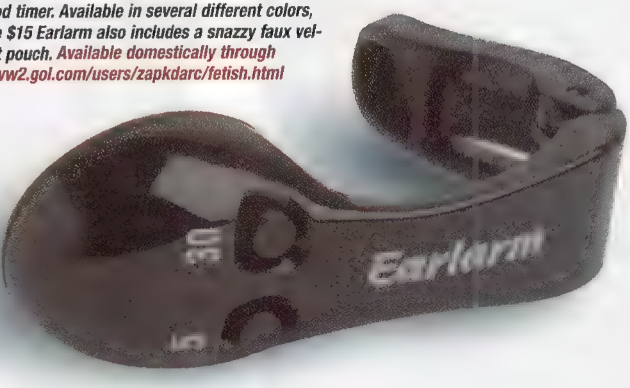
TVMESSENGER *For the couch potato who's taken root, the TVMessenger reveals who's calling right on your TV screen. It's basically a Caller ID box for your television. As soon as a call comes in, the Caller ID info is displayed in white text in the upper right corner of your screen. A log keeps track of recent names, numbers, dates, and times of calls. A Message Waiting/New Call Indicator on the box blinks when you have unretrieved voice mail messages as well. On the TVMessenger web site is the slogan "The TVMessenger gives you the power to run to the phone on your terms." Why not just get a cordless phone, too? Northern Novelties; 888-632-1310; www.promobility.net/tvid/*

PSION SERIES 5 *The new Psion Series 5 takes this Kick-Ass line of PDAs to new heights. Featuring a speedy 32-bit ARM 7100 processor and the shiny new EPOC32 operating system, the Series 5 provides both keyboard and pen interfaces, and a full-width 640x240 grayscale screen. Voice recording capabilities, 115Kbps IrDA, PC synchronization software, and 4MB or 8MB of RAM round out this pocket wonder, starting at $599. Future versions of the Series 5 will feature Java compatibility and the even faster StrongARM CPU. If you want full PC functionality in your pocket, no one does it better than Psion. Windows CE, look and learn. Psion; 800.997.7466; www.psion.com*



BOFFIN 7 *On every network, there's always a few discs that everyone needs access to—enter the Boffin 7 Bay CD-ROM Server. Seven Plextor 12Plex (12x) drives are packed into a tower along with a proprietary SCSI and network combo that you need only plug into any Ethernet or Token Ring network for instant connectivity. It effectively allows you to share seven CD-ROMs with anyone connected to your network. No software needed, since it's fully compatible with NetWare, UNIX, Windows NT and 95, IBM OS/2 Lan Servers and Banyan Vines natively. A built-in WWW server makes it possible to access CD-ROMs using any browser, allowing you to put web pages on CD-ROM to be shared immediately. It also comes bundled with Axis' MediaAgent CD-ROM server software that allows for the management of users and groups with its internal security or in conjunction with Windows NT and Novell NetWare password-level security. $3,463 from Boffin Limited; 800.248.5328; www.boffin.com*

EARLARM *The Earlarm is yet another ingenious Japanese invention. Clip the hearing aid-like device onto your ear lobe, and press either the 5- or 30-minute button. Now close your eyes and start sleeping. After the designated time, a pulsing beep will jar you from your dreams. The alarm's volume is purposely annoying, sure to wake even the soundest snoozer. If the features aren't enough of a draw, wacky pics on the box include a salaryman startled into wakefulness, a delivery guy waking from an in-vehicle nap, and a young woman using the Earlarm as a food timer. Available in several different colors, the $15 Earlarm also includes a snazzy faux velvet pouch. Available domestically through www2.gol.com/users/zapkdarc/fetish.html*



HANDEZE *Carpal Tunnel Syndrome keeping you from the keyboard? People who suffer from repetitive stress injuries may find some relief in Handeze Therapeutic Support Gloves. The fingerless gloves use a patented fabric called Med-A-Likra that "supports, massages and warms the wrist and hand." The company says that wearing the gloves can reduce the risk of RSI, and helps calm swelling, pain and inflammation if you're already suffering from RSI. Available in several sizes and two color choices—blue or tan—the gloves sell for $19.95. Handeze; 800.255.3427; www.handeze.com*

POWER CINEMA VCR SLV-AV100 Let's face it, one dual-purpose expensive black box with a remote control beats two. Especially when the quality is Sony. The Power Cinema VCR SLV-AV100 combines a hi-fi stereo, 4-head stereo VHS VCR, and Dolby ProLogic A/V receiver in one compact $699 unit. The VCR includes VCR Plus+, 4-head Dual Azimuth recording/playback, and APC II for crisp picture quality. The A/V receiver decodes five channels, and the on-board Digital Signal Processing offers a choice of seven acoustic environments. And it's only 17x6.5x16.5-inches. Sony; 800.342.5721; www.sony.com

SUPERPILOT UPGRADE The PalmPilot's inventor doesn't think anyone could possibly need more than 1MB of memory. Well, he's wrong, and Iowa-based TRG has created a much-needed 3MB SuperPilot upgrade for the quintessential PDA. With models ranging from 2MB of FLASH and up to 3MB of SRAM, and custom configurations are available in large quantities at special pricing to meet specialized requirements. And since the SuperPilot board uses SRAM, it consumes significantly less power than PSRAM in stand-by mode. This indispensible upgrade is $250 including shipping Technology Resource Group; 515.252.7522; www.trgnet.com/pilotweb/pilot.html

FLOATING WINDOWS Floating Images, designers of 3D imaging technology for retail displays, is releasing Floating Windows for use with its Real-Depth Adapter. When combined with the Real-Depth adapter, which enables the viewing of specially formatted 3D source material on any television or monitor, Floating Windows allows two Windows programs to be viewed in three dimensions. See one application, such as a spreadsheet, in the foreground and the second, perhaps Monster Truck Madness, in the background. All this without funny-looking 3D glasses. And it is pretty much all done with mirrors. The expected retail price of the Real-Depth Adapter is $79.95, with the Floating Windows software retailing for $199. Floating Images; 516.338.5000; www.floatingimages.com

Talkabout
MOTOROLA

MOTOROLA SPORT 10X Need to keep in touch while camping, biking, or even browsing? Motorola's Sport 10X model Sport Radio provides two-way talk with a five-mile range. Each 6.2x2.5x1.2-inch radio weighs in at 11 ounces. Included with each $299 10X is a Ni-Cad battery pack with a 10-hour lifespan. (That's one hour of talk time and nine hours of stand by.) Unlike the less expensive two-mile range Sport Radios (Sport 7, Sport 7x), the 10-channel Sport 10X, with its 2-watt power output, requires an FCC GMRS license. The 10X comes in four snazzy sports colors including Hunter Green, Camouflage, Shadow Black, and Sunstreak Yellow. Accessories such as headsets, speaker microphones, and cases are also available. Motorola; 800.353.2729; www.mot.com

Sooner or later, you'll run into Veronica Schnoodle.

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Designed to run even the most graphic-intensive games and Internet entertainment, you'll get awesome 2D and 3D graphics cards, the screaming speed of Intel's processors, and more.

We pack the Millennia XKU with the Pentium II processor featuring MMX technology, and the MME with a Pentium processor with MMX technology. We'll include a software pack with every Millennia. You choose one of five bundles.

Add our Fusion3D option, and you'll get DVD software, Monster 3D graphics card, AWE 64 PCI sound card, a two speaker satellite with a subwoofer stereo system — and five of the most intense multimedia games available today.

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Intel 233MHz Pentium® processor with MMX™ technology
64MB SDRAM
6.4GB Ultra ATA hard drive
24X EIDE variable speed CD-ROM
17" Micron 700FGx, .26dp (16" display)
512KB pipeline burst cache, flash BIOS
100MB Iomega Zip drive, 3.5" floppy drive
32 voice wavetable stereo sound
USR Sportster 56K x2 data/fax modem*
PCI 64-bit 3D video, MPEG, 4MB EDO DRAM
Microsoft® Intellimouse™, USB connections
Microsoft Windows® 95 and MS® Plus!
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-year/3-year Micron℠ Power limited warranty

with Hitachi 19" SuperScan CM 751 (18" display)
.26dp color monitor, add $300

$2,699

MICRON MILLENNIA XKU

Intel 300MHz Pentium II processor (features MMX technology)
128MB SDRAM
8.1GB Ultra ATA hard drive
24X EIDE variable speed CD-ROM
17" Micron 700FGx, .26dp (16" display)
82440LX chipset
512KB internal L2 cache, 2MB BIOS
100MB Iomega Zip drive, 3.5" floppy drive
32 voice wavetable stereo sound, powered speakers with subwoofer
USR Sportster 56K x2 data/fax modem*
AGP 128-bit 3D video with 4MB SGRAM
Microsoft Intellimouse, USB connections
Microsoft Windows 95 and MS Plus! CD
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-yr/3-yr Micron Power limited warranty

with Hitachi 19" SuperScan CM 751 (18" display)
.26dp color monitor, add $300

$3,999

MICRON SOFTWARE SOLUTIONS PAKS

Quicken Financial Pak: Quicken Deluxe 6, Family Lawyer, Parent's Guide to Money, Financial Planner
EdVenture Pak: Thinkin' Things #2, Sheila Rae The Brave, Reader Rabbit's Reading #1, Freddie Fish:Missing Kelp Seeds, Putt-Putt Saves the Zoo
Multimedia Xcitement Pak: (MMX enhanced titles, Call for details)
Home Productivity Pak: Family Doctor, Comptons Encyclopedia 1997, Mavis Beacon Teaches Typing, Printshop Ensemble 3, Net Nanny, Crayola Magic 3D
Academic Bundle: Merriam Webster's Collegiate, Word Smart, Grolliers Encyclopedia, Student Reference Library, Quicken SE, Hoyle Classic Games

FUSION 3D OPTION PAK

DVD-ROM,** DVD software
E4 Cool DVD PCI decoder card: 6 channel AC-3 to 2 channel out capability, SPDIF output (digital audio out)
AWE 64 ISA sound card
Cambridge SoundWorks/MicroWorks - 2 speaker satellite with subwoofer stereo system
Monster 3D graphics card with 4MB memory
Fusion 3D game pak: Mech Warrior 2: Mercenaries 3Dfx version, AH-64D Longbow, U.S. Navy Fighters '97, Command & Conquer, Popular 3Dfx Racing Sim
MS Sidewinder Pro Joystick

XKU add $649
MME add $699

*Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.
**Note, the CD-ROM drive will be removed upon purchase of the DVD upgrade.

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Product Information Number 106

MICRON POWER℠ WARRANTY

5-year limited warranty on microprocessor and main memory
3-year limited parts-only system warranty (1-year for TransPort VLX)
1-, 2- or 3-year optional on-site service agreement for Micron desktop and server systems
30 days of free Micron-supplied software support for Micron desktop systems; 3 optional network operating system incident resolutions included for Micron server systems
30-day money back policy
24-hour technical support

The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.

Designed for Microsoft® Windows® 95

Micron Sales Hrs: Mon-Fri 6am-10pm, Sat 7am-5pm (MT) Technical Support Available 24 Hours A Day, 7 Days A Week. Toll free from Mexico: 95-800-708-1755 Toll free from Canada: 800-708-1758 • Toll free from Puerto Rico: 800-708-1756 • Int'l Sales: 208-893-8970 Int'l Fax: 208-893-7393

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Our software is designed to assist you in reproducing material for which you own the copyright or have permission to copy from the copyright owner. *Suggested retail price U.S. dollars, subject to change without notice.

Product Information Number 87

THE SAINT

WITH ALEX ST. JOHN

The **Dire** Driver **Dilemma**

UNTIL **SOMEONE** TAKES RESPONSIBILITY, **DRIVERS** WILL CONTINUE TO SUCK

Why are drivers so badly broken all of the time? Here's an excerpt from an e-mail I sent to DirectX's Program Manager (and the reply I received) just before leaving Microsoft:

Q: How did we get the D3D drivers shipping in DX5? Did we write them, did IHVs or OEMs come here and write them with us, did they ship us a driver? Are they all certified in some way?

A: They come in to fix bugs (typically 20 to 30) that were not caught in the tests (we're improving those). Assuming the critical bugs get fixed, we'll put them in the box. We don't include binary drops from the IHVs or OEMs. These have too many bugs, even if they have passed.

Our driver team is not big enough to handle everyone, so we focus on volume leaders (e.g., S3, ATI) and high visibility parts (e.g., 3Dfx, Rendition).

To see current status go to the intranet and select "Testing Status". Many of those drivers marked "not shippable" we will ship anyway, as they are in better shape than previous drivers.

That's why drivers are always so incredibly broken that they are virtually unusable. On average, Independent hardware vendors fail Microsoft certification testing 4-6 times before delivering a driver that can actually pass. Drivers that pass still contain 20-30 critical bugs.

Roughly 80% of multimedia title support calls under Windows are about driver-related issues. Busted drivers are the number one reason, head and shoulders above anything else, that games don't work.

> On average, **independent** hardware vendors **fail** Microsoft certification testing 4-6 times before **delivering** a driver that can actually **pass**. Drivers that pass **still** contain 20-30 critical **bugs**.

Here's just a few of the myriad forces that contribute to this problem.

Prestige

Great programmers don't work as grunt driver programmers for long, they go on to fun things. The hardware companies' driver programmers aren't the cream of the developer crop. And hardware companies, being hardware companies, don't emphasize the same software quality control that software companies do. The exception is smaller state-of-the-art chip makers. These guys usually have some smart people working on their drivers. But they devote energies to promoting their random API or adding mutant features in the hopes somebody will support it.

It's not a prestige job at Microsoft either. Drivers are a check box item. It's not considered "mission critical" to support every kind of hardware imaginable.

Conflict of interest

Microsoft's priority is to make its OSes look good. That means delivering drivers supporting only the most critical functionality. It's not important to Microsoft to support every little nuance that differentiates a chip, or wring the last MIPS of performance out of it.

By contrast, an IHV's priority is to specifically differentiate themselves from the dozen or so competitors making essentially the same products.

IHVs need to appear to have the fastest hardware. "Appear" being the critical distinction, because it's usually easier to hack a driver to do better on a benchmark test than it is to actually make the hardware go faster.

In the end, Microsoft tries to ship a stable batch of basic drivers on a fairly regular basis aligned with major OS updates, while IHVs constantly ship new drivers to one up each other. The result is all-out, never-ending, brutal driver chaos.

The Windows OS itself assumes that the original driver will never change. The mechanism for identifying and upgrading drivers is very primitive, so driver upgrades are always fraught with peril. Especially when OEMs hack standard drivers to "enable" some new exciting feature. Now, when a gamer upgrades a driver, the hacked code remains in the system, trying futilely to communicate with it's missing counterpart and causing the system to crash mysteriously.

IHVs often have multiple runs of their hardware, tweaking each new iteration just enough to make it incompatible with the previous generation's drivers, yet never changing the PCI bus ID to reflect the alteration so installation programs can correctly identify it. Instead they ship a new driver—usually incorrectly versioned—with the new hardware and are shocked when it all comes crashing down.

ALEX ST. JOHN From his position as Microsoft's game technology evangelist, Alex St. John was responsible for the controversial DirectX APIs that have either taken PC gaming to the next level or were horribly broken, depending on your point of view.

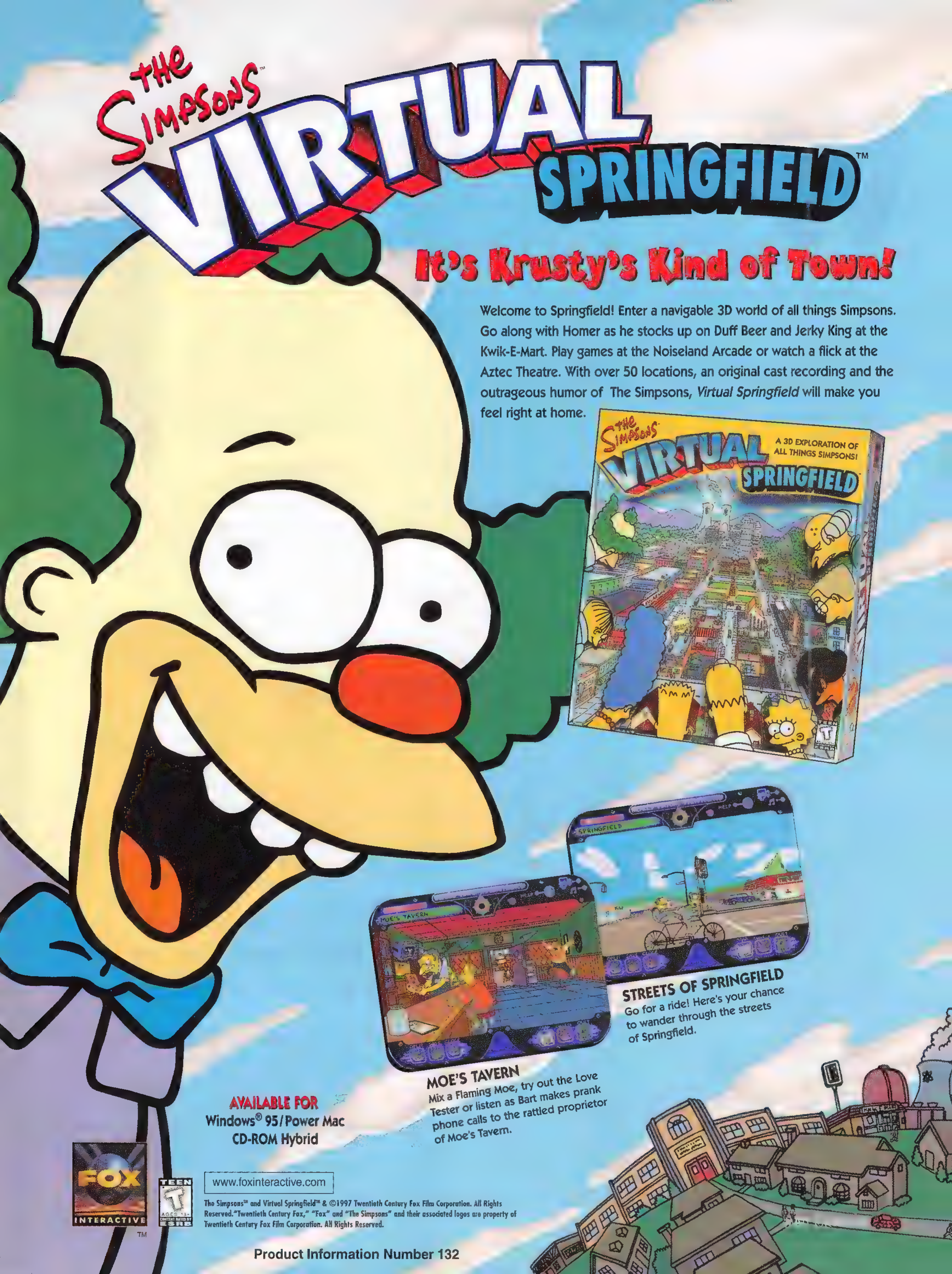
The Extensibility Boojum

IHVs scream for extensibility in a driver architecture. It's their opportunity to bypass the Microsoft API's limits in order to differentiate themselves, but this means using 50 million PC consumers as guinea pigs. Remember that even "Certified" drivers have 20-30 critical bugs, so imagine IHVs shipping their own mysterious extensions with hardware. How do you certify them? There's no way to test an extension for quality, and experience says there's a 99.9% chance that it's busted.

When the system goes BOOM! And the disk gets trashed, most people have no idea whose fault it was, but the startup screen says "Microsoft."

The net result is that PC drivers are constantly broken, so consumers who might otherwise be inclined to buy PC software get a Playstation instead.

This problem won't go away until somebody takes responsibility and makes detailed compliance tests and benchmarks, so consumers can know exactly who is responsible when something goes wrong, and then hold them accountable. Until this happens, you're all guinea pigs. ■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Product Information Number 132

GAME THEORY

WITH T. LIAM McDONALD

Going on the **Offensive**

USING **TOLERANCE** TO BUILD A **BETTER** FUTURE

No one has the right not to be offended. It's not in the Constitution or the Bible. I don't recall ever reading "Thou shalt not offer rude comments or demeaning humor." I don't recall anyone promising that we were entitled to a life free from bother or annoyance. That's part of living in this messy country with its inconvenient freedoms and unchecked permissiveness.

Now I'm hearing that games need to clean up their act. In windy editorials and on message boards, people are crying foul about the "racist" content of computer games. The current target is *Shadow Warrior*, the latest game made with the original *Duke* BUILD engine. 3D Realms has an uncanny knack for pissing people off about the content of its games. It's very deliberate about it, being just offensive enough to get people talking and paying attention. It all helps keep the hype rolling, and makes the games successful.

But to some, they stepped over the line with *Shadow Warrior*. The main character in this fairly conventional 3D shooter is a cartoonish Ninja warrior named Lo Wang. Obviously, when you name a character "Lo Wang," you're not taking things too seriously. The problem many have with the game is its stereotypical depiction of Asian people in manner and speech.

Lo Wang talks in a comical pidgin English, spouting one-liners as he kills people. He begins each game shouting, "Who want-a some wang!" A good explosion prompts him to say, "Just-a like Hiroshima!" Hidden locations: "Ancient Chinese secret!" He picks up fortune cookies to gain health, shoots monsters wearing coolie hats, and stampedes through some vaguely Oriental-looking levels. The designers can't quite distinguish between what's Chinese and what's Japanese.

> **Southerners** are depicted as a bunch of **murderous**, flatulent, moonshine-drinking, **pork-rind-eating** half-wits with bad backs, shouting "Get offin' mah land!" and "It's time to **open** up a can a **whupass**!"

Is it offensive? Sure. Is it funny? It's freakin' hysterical. Should we be upset that it's offensive? Hardly. The only reason offensive or stereotypical humor should concern society would be if it directly affected the way an allegedly aggrieved party was treated. I'm not talking about vague and unproven liberal ideas like "contributing to an atmosphere of hostility" or "perpetuating denigrating stereotypes." I'm talking about real and provable discrimination. Since people don't find their moral compass inside a game but from their own values and upbringing, such content in a game is irrelevant.

There are things in society I find offensive. Let's take the Notre Dame football mascot: an inebriated, pugilistic, dwarfishly caricatured Irishman. It calls to mind the racist old Punch cartoons that the British used to denigrate my ancestors. It promotes an idea of the Irish as a bunch of drunken morons looking for a brawl, and if anyone ever said such a thing to my face, I'd smack them over the head with my whiskey bottle. I defiantly think it's time we petition Notre Dame to find a more culturally sensitive Irish representative, perhaps Rosie O'Donnell. (And don't get me started about Lucky Charms! Magically delicious... my ass.)

What about all those gangster flicks in which Italian-Americans are portrayed as thick-necked goons who wear shiny suits? Just because you stick a couple people under the 50-yard line at Giants stadium doesn't mean your culture is insignificant. And how about the cliched depiction of Germans in *Wolfenstein 3D* and many other games as nothing more than a bunch of Nazi thugs who deserve to die? (Well, okay, so maybe that one's valid...)

The games made with the BUILD engine have all been more or less offensive. *Duke Nukem 3D* is rampantly misogynist and features crass bathroom humor. *Blood* is wall-to-wall Satanism. Most egregious is *Redneck Rampage*, which is easily as offensive to southern culture as *Shadow Warrior* is to Oriental, yet no one raises a fuss. Southerners are depicted as a bunch of murderous, flatulent, moonshine-drinking, pork rind-eating half-wits with bad backs, shouting "Get offin' mah land!" and "It's time to open up a can a whupass!" Talk about your stereotypes. I know southerners who would never eat pork rinds.

T. LIAM MCDONALD is the all-knowing god of gaming. His mother still can't believe that he plays games for a living.

But rednecks are protected under those intangible rules some people have about what's a subject for humor. Rednecks are fair game, as are men, Italians, Germans, and the French. Levantines, Asians, and gays are on the borderline, but their lobbying groups are fighting to make sure no one ever makes fun of them again. Jewish and black people can be mocked only if you're one of them. As the feminist movement has proven, women have no sense of humor, so we shouldn't talk about them at all. (And *please* stop telling Shel she's cute. That is *so* wrong.)

Computer games are aimed at a male audience, and that audience, myself included, often enjoys lowbrow humor. So what? Does Lo Wang hurt anyone? If as an Asian-American you're offended by that kind of humor, either don't patronize it, or lighten up. This is a multicultural nation. We've always had an uncomfortable mix of people, and we often express our natural distrust of something different through off-color humor. It's a lot better than breaking shop windows or burning crosses, and one does not lead to the other. Those feelings of mistrust will never go away: It's human nature. The best thing we can do is laugh about them and move on together.

Frankly, we'd all be a lot happier if we just made fun of Canadians. They deserve it. ▯

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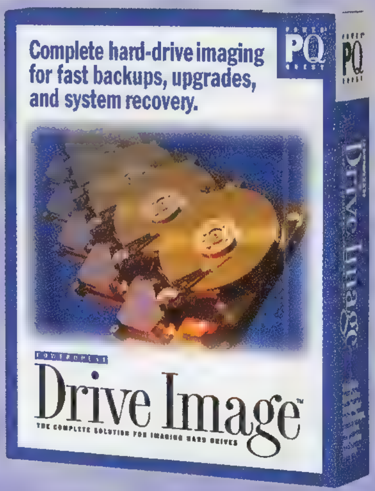
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Product Information Number 281

ON THE LINE

WITH SHEL KIMEN

Filtering the Information Flow

HOW TO FIND QUALITY HIGH-TECH INFO IN THE FLOOD OF TEXT

Everyone wants to tell you how to do the Internet. How to make web pages; how to make Java applets; how to add Shockwave; how to find underground alterna-sites; how to be a woman online; how to be gay online; how to be secure, monitor your kids, make money, sell brownies, fall in love, and so on, and so on.

A search on Amazon.com for Java turned up more than 200 titles—*Java with C++, Java for Entertainment, Java in 21 Days, Java for Philosophers* (well... not the last one). Nonetheless, there are too many. You could read every computer magazine, watch every Internet-related TV special, talk to every bookstore sales clerk, and no two will recommend the same book. And if it ever happens that a book gets mentioned twice, odds are that the book has a really cool cover. It doesn't mean the book is good, useful, or even useable.

This stated, how does one actually *find* a helpful resource without wasting $200 in trial-and-error purchases?

First off, forget the library. Most content that makes it to library shelves is too out of date to be accurate with today's rapid technology market. Skip the newspaper, too. Unless you get the *San Jose Mercury News*, most newspaper journalists are hardcore newbies when it comes to technology reporting. You might trust one or two (at most) computer-related magazines, because at least magazine journalists have the time and inclination to look at the table of contents, and a few chapters before reviewing a product.

> Most **content** that makes it to library shelves is too **out of date** to be accurate with today's **rapid technology** market. Skip the newspaper, too. Unless you get the San Jose Mercury News, most newspaper journalists are **hardcore** newbies when it comes to technology reporting.

But the best answer, per usual, is the most obvious answer: Use the Internet.

Amazon.com (**www.amazon.com**) invites readers to submit their own reviews. While these reviews may be short on wit and full of misspellings, one thing is certain: The reviewers were interested in the subject enough to actually *read* the book. This is more than you'll get from *most* (not *all*) journalists. Getting the thumbs up on a Java book for dummies from someone who considers himself a Java newbie is a sure-fire bet that the book will be useful.

A typical Amazon.com book info page will have a description, (marketing) words from the publisher, (witty) words from Amazon staff, (apologetic) words from the author (if available) and, the super bonus, (sincere) words from customers!

If you've ever used Firefly (**www.firefly.net/Home.html**) for finding new music, you'll be pleased to discover that the company is taking its technology to Barnes and Noble (**www.barnesandnoble.com**). Soon you'll be able to visit Barnes and Noble's Web site, and fill out a personal profile. It will ask you what you are looking for in a book, and what other books you like. It'll even ask you to rate the books in its database that you've read. It then takes this data and builds a personal profile for you.

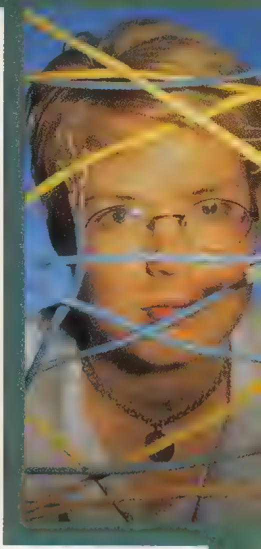
Through the wonders of artificial intelligence and clever back-ends, the agent will recommend other books you might like. The more data you give about yourself—and the more books you personally rate—the better the agent will become at honing in on your needs. Everyone wins. Firefly also builds communities around people of similar interests, so you might just make a pal or two in the process. For more specific needs, it's best to discover books from specialty web sites such as Web Monkey (**www.hotwired.com/webmonkey/**) for web design and Gamelan (**www.gamelan.com**) for Java and Javascript.

These sites are run by experts who actually know the dope they're spewing. These sites also maintain the support of people who use the technology (real life tech-heads), making them credible bytes for hungry programmers. Rest assured, the books that find their way into these sites come highly recommended.

If you're of the super-tech programmer flava, finding good books may not be quite so simple. As you probably well know, there's a definite shortage of whiz kids with time enough to widdle about sites, reading reviews from people who, although tech savvy, are not tech professionals. These high-end types have even less time to post their own reviews. You rare breeds will have to do what everyone else in your position has to do—go to the Usenet newsgroups and mailing lists.

If you're into VRML, ask people in the **comp.lang.vrml** newsgroup about books they've found useful. If you're into Java, check out the **comp.lang.java** group. This is where the techno-elite hang their hats. You'll find solid and useful opinions.

And while you're at it, holler over the cubicle wall to the programmer sitting next to you. Heck, this is probably the first place to start! ▯



SHEL KIMEN (kimen@well.com) has spent more time online then is reasonably healthy for one person and dreams in hypertext.

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Product Information Number 112

FAST FORWARD

WITH TOM HALFHILL

Point-and-**Shoot** PCs

BREAKTHROUGH TECHNOLOGIES BRING THE **PC** TO THE **PEOPLE**

Here are some online discussions I've participated in recently: *Can you get less residual hypo by treating fiber-based paper in a low-dilution ammonium thiosulfate fixer instead of a sodium thiosulfate fixer? Can you put a shoulder on the density/log-exposure curve of Ilford Delta 400 Pro by pulling development in Kodak T-Max? Would a non-retrofocus Leitz 21mm f/3.4 Super Angulon show less rectilinear distortion than a retrofocus Canon FD 20mm f/2.8?*

If all this sounds like mysterious technobabble, now you understand how newbies feel when they listen to people like us talk about computers. Every technology has its newbies, techies, geeks, and lingo.

Anyone who reads a magazine such as *boot* is a computer enthusiast by definition. You know that "overclocking" doesn't mean setting your alarm clock 10 minutes fast so you won't be late to work. You know that a "scuzzy bus" isn't the way people who live in poor neighborhoods get around town. You know that a "registry file" isn't a list of voters in your precinct.

But you probably don't know ammonium thiosulfate from sodium thiosulfate. Or how to use a reflection densitometer to measure the Zone I threshold above film-base-plus-fog. Today, the only people who have to know are photo enthusiasts who strive for maximum technical control and the highest possible quality. You might think they're crazy or obsessed. But then, they might think the same thing about you.

What's my point? Last month I predicted smartcards will be the next "killer app" for personal computing. When smartcards are as popular as credit cards, and when you can securely buy stuff online with a smartcard, and when you can download cash from your bank account without trudging down the street to an ATM, practically everyone will want a home computer with a smartcard slot. But that doesn't mean everyone will want the kind of computers we have today. PCs are still way too expensive and difficult to use.

These **low-end** computers—call them NCs, **browser** boxes, whatever—will **someday** be more **popular** than PCs.

Instead, they'll want a simple, easy-to-use box that costs only a few hundred dollars, won't become obsolete in 12 months, and doesn't force them to learn a lot of technical mumbo-jumbo. In short, they'll want machines that do the same thing for computing that inexpensive point-and-shoot cameras do for photography.

All this seems slam-dunk obvious to me, but you wouldn't believe the ridicule I've endured whenever I mention this subject. Some people are so caught up in their enthusiasm for PCs that they just can't imagine why everyone in the world isn't thrilled to deal with control panels, SIMM slots, and TCP/IP stacks.

When Oracle, IBM, and Sun Microsystems first outlined their plans for network computers in 1995, it struck me like a breath of fresh air. At last, somebody had a promising alternative to PCs. Not a *replacement* for PCs, mind you, but an alternative.

Microsoft, Intel, and their numerous knee-jerk followers immediately jumped on the defensive. They heaped scorn on the idea and denounced it as nonsense. Sometimes I'm still not sure whether they were really that stupid about NCs, or if all their trash talk was merely a ruse to distract the gullible, so they'd have time to catch up.

I suspect the latter. In December 1995, I predicted Microsoft would flip-flop on NCs within a year. I was wrong. It took a few months longer. So far this year, Microsoft has: (1) established a new standard for NetPCs, which implement the same basic concepts as Oracle-style NCs; (2) publicly endorsed the idea of Windows terminals; (3) licensed multiuser technology from Citrix for future versions of Windows NT; (4) introduced Zero Administration for Windows (ZAW) for centralized management of PCs and NetPCs in corporations; (5) repositioned Windows CE as an operating system for "thin client" computers as well as mobile devices; and (6) spent nearly half a billion dollars to buy WebTV Networks, which makes technology for low-end browser boxes that plug into TV sets.

TOM HALFHILL is a senior editor at *Byte* magazine and the author of two computing books. He first became interested in computers during the disco era.

The WebTV acquisition is particularly interesting. I visited WebTV a long time ago, when it was still a tiny start-up company in a former auto-dealer showroom near Silicon Valley. I saw some innovative technology—especially for displaying legible Web pages on low-res TV screens—but nothing worth the $450 million Microsoft paid. Microsoft should have been able to duplicate WebTV's technology in 12 to 24 months instead of buying the company. It looks to me like Bill Gates didn't think he could spare that much time. That's how fast this future is unfolding.

Microsoft is pouring more cash into WebTV, too. The company's help-wanted signs are plastered everywhere in Silicon Valley: full-page ads in newspapers, billboards on the Bayshore Freeway, and slides that flash on the screen at movie theaters. And guess what? WebTV boxes have smartcard slots.

These low-end computers—call them NCs, browser boxes, whatever—will someday be more popular than PCs. They won't replace PCs; enthusiasts like us will still buy full-powered computers, just as photo enthusiasts still buy full-powered cameras. But if you've got an inexpensive, automatic, point-and-shoot camera instead of a $3,000 Nikon F5, you should grok why people who aren't computer nuts will prefer an inexpensive, automatic, point-and-shoot computer. It won't be as powerful or as flexible as a PC, but it'll get the basic jobs done, and that's what matters. b

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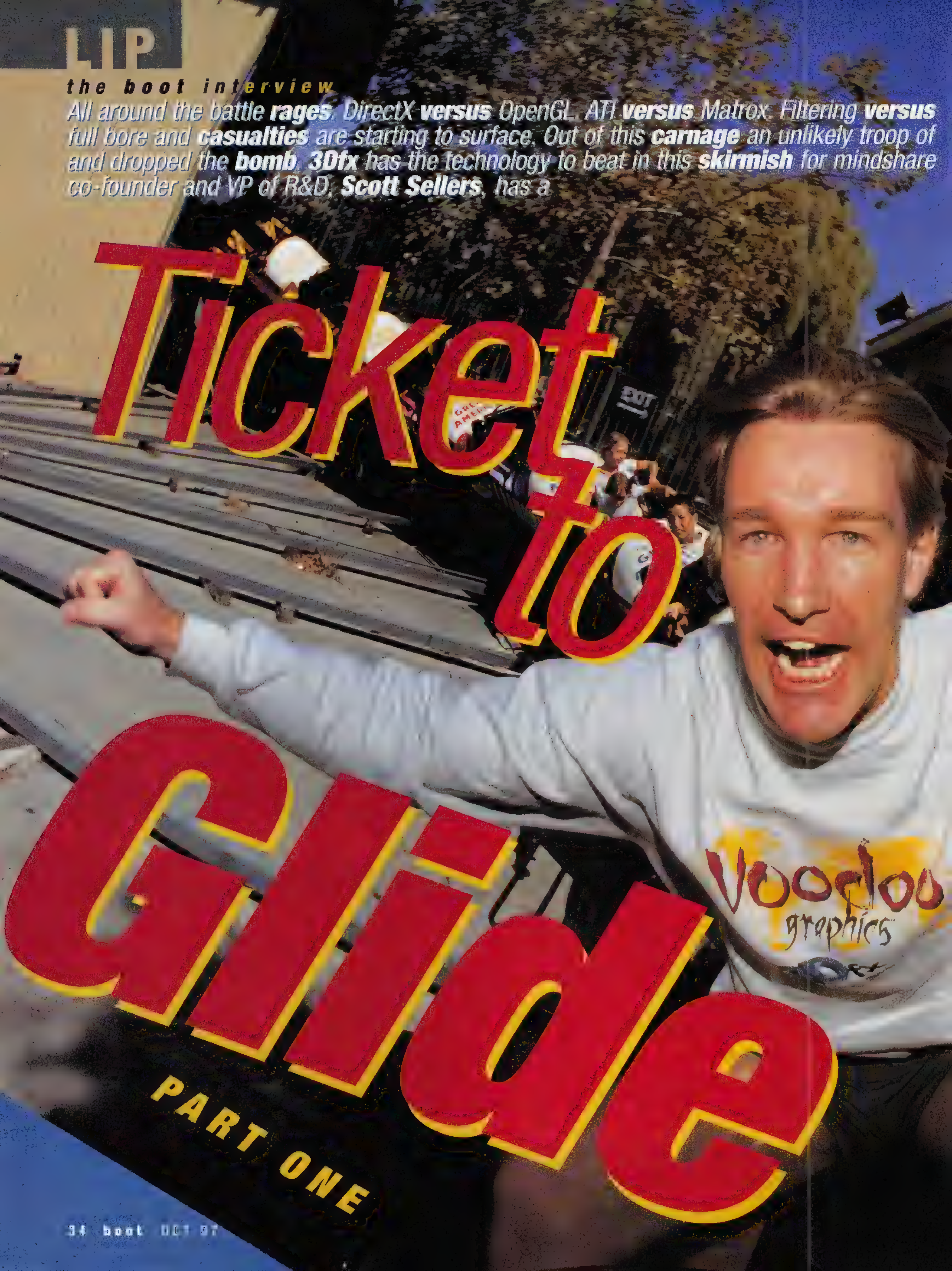
Product Information Number 236

the boot interview

All around the battle ***rages****. DirectX* ***versus*** *OpenGL. ATI* ***versus*** *Matrox. Filtering* ***versus*** *full bore and* ***casualties*** *are starting to surface. Out of this* ***carnage*** *an unlikely troop of and dropped the* ***bomb****.* ***3Dfx*** *has the technology to beat in this* ***skirmish*** *for mindshare co-founder and VP of R&D,* ***Scott Sellers****, has a*

Ticket to Glide

PART ONE



frame rate. The 3D wars are
SGI defectors has emerged
and marketshare. And 3Dfx's

***boot* 3Dfx has some of the best technology in the industry, but you're also one of the smallest players in terms of sales. How do you explain that?**

Sellers I disagree with that assessment. We have a significant installed base in the gaming community on the PC, which is a difficult number to wrap your hands around. Others will tell you very different numbers, but we feel we've done extremely well, and we are by far the leader in terms of targeting that community. So if S3 is a $600 million company, we still dramatically outsell S3 into that market. So yes, we don't have the business presence that S3 has, but they don't have anywhere near the gaming presence that we do.

***boot* You don't fab chips. You're not actually making cards. So what does 3Dfx really do?**

Sellers Well, the business model has always been a fabless semiconductor model, which is very traditional in the Valley. Look at all of our competitors—S3, ATI, Matrox. Take your favorite graphics accelerator company—all of those are fabless semiconductor companies. No one fabs their own chips anymore, so there's nothing unique about that. Everyone goes overseas and manages the fabrication of these chips. Initially we wanted to sell high-end boards and we wanted to sell chips to the consumer board-level companies such as a Diamond or a Hercules or a Northgate or whoever. But there was a great price separation—as well as feature and performance separation—because we didn't want our board-level sales to get anywhere near Diamond, because of course Diamond would feel threatened. We found that as we started succeeding and getting bigger, each of those was defocusing the other. And so we felt that spinning the board business off was the smartest thing to do because we could just focus on our mainstream business, which is selling cost-effective consumer solutions.

So Quantum 3D [3Dfx' spin-off company] is now 100% committed to selling our chips in the professional markets, and the digital simulation LDE, government, what have you. That allows 3Dfx to just focus on producing the best chips we can do. Now there are no tradeoffs within the company. It allows both companies to focus 100% on what they committed to doing.

***boot* Do companies such as ATI, which produce their own cards, have any advantage over 3Dfx?**

Sellers They have some advantage in being able to reach the consumer quicker. There's no question that selling a chip to Diamond, and Diamond producing a card, and then it finally getting to the consumer channel... that takes time. That's something ATI

> *"We don't have the **business** presence that **S3** has, but they don't have **anywhere** near the **gaming presence** that we do."*

PHOTOGRAPHS BY
MARK MADEO

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and Matrox don't have to worry about. They live in a lower margin model business-wise, which is more difficult because their cost is more. So they also have inherent disadvantages.

Moving forward we feel—and this is no surprise to anyone that follows the PC market—the money is really made on the motherboard. So our focus moving forward is to be on every single Intel motherboard that ships. This is how S3 grew as large as they have. It's why ATI has been successful in recent years, because they abandoned what used to be a board-only business model and now they have a hybrid model where they sell motherboard chips to Intel and also have their add-in board market.

boot ***Does 3Dfx have any motherboard deals pending with top 10 OEMs?***

Sellers We currently do not. But we don't have any announced products that would fit that category.

boot ***When might 3Dfx have a motherboard solution?***

Sellers I don't know what we're saying publicly about that right now.

boot ***Will it be before the end of the century or...?***

Sellers Oh yeahh! [laughs] I can absolutely say that, yes!

boot ***1998?***

Sellers 1998.

boot ***Can 3Dfx survive if you don't get on the motherboard?***

Sellers There's no question that we can survive; but there's no way we can be the dominant graphics player in the PC without being on the motherboard. We are not here to be a niche player. We are here to be the dominant graphics supplier for the PC.

boot ***Do you have a time frame as to when that might happen?***

Sellers As fast as we can possibly make it happen.

"The money is really made on the motherboard. So our motherboard that ships."

We see ourselves as much more than just a PC graphics chip supplier. We see ourselves as a 3D graphics technology supplier across a variety of platforms. That's why we're going to be successful, as opposed to our competitors that just exist in the PC space.

Developers have maybe eight different platforms where they can target a game. Imagine seamlessly porting across all of those platforms. Using a common software and hardware technology that doesn't force them to hire engineering teams for each platform. That's what we're really trying to do with 3Dfx.

boot ***What's the biggest obstacle to attaining those goals?***

Sellers Historically, the problem in the PC market has been this leapfrogging effect. Development times are so long, and they become longer and longer because now we have graphics chips that are multiple millions of transistors each, which is CPU size. And how long does Intel take to build a CPU? How long does AMD take to build a CPU? Three to four years. We are asked to do the same thing in less than a year. And the other reality is that product lifecycles are becoming significantly less than a year. Of course you have multiple design teams working in parallel.

But you still get this leapfrogging effect where OEMs make their decisions every six months. Maybe S3 is in it for this few; six months later they switch out, and now ATI is in. And they just continue to leapfrog.

We will be as successful as anyone else in the PC space, but by not having a presence in other markets all the other PC graphics companies are going to have their ups and downs. We want to build a much stronger foundation by having significant presence in these other markets. It's also very complimentary if all that content is developed on 3Dfx because of this platform presence. That just makes our PC story even stronger and limits the possibility of us getting leapfrogged. If we have all the content and we have the best games developed for 3Dfx from scratch, using only 3Dfx technology and possibly 3Dfx proprietary features—that's what's going to win the war.

boot ***What platforms are 3Dfx targeting specifically?***

Sellers Anything that has anything to do with 3D electronic entertainment. Starting from the top, location-based entertainment markets. Ross' Quantum 3D company is really focused on that area. Even though we don't directly sell into that market, the software developed in that market is mostly based on GLIDE now. So that content can then filter down into the other markets. The next is the arcade. We are the number one graphics supplier to Williams. We sell to Taito, we sell to Konami. And there are other companies coming. Again, the same principle: Develop on our hardware, develop on our software, and it migrates down.

Certainly, we have a strong presence in the PC. We've announced a product that works for the Mac, and we expect that market to be very exciting and interesting.

And we're developing a console with Sega. So we're talking about five different platforms with common, consistent hardware and software—and developers love it.

boot ***Could console games such as*** **Mario 64** ***be done on the PC?***

Sellers Absolutely, no question, 100%. It would look beautiful on our board and much, much better than it currently does on an Ultra 64. That game probably processes around 2,000 to 3,000 polygons in a scene, there's very little mip-mapping going on—they just use very, very small textures and bilinear filter them up, so it's this blurry image. And one of the big problems with the Ultra 64 is that there's very little memory on-board, so all the Ultra 64 games look the same because they all use small textures and filter them up, so everything is very blurry. You always want to rub your eyes because all these games are so blurry.

If you took *Mario 64* and tried to run it on a PC with our board, you'd get four times the resolution. You'd be able to use much larger textures—which would make it much more crisp. With 2,000 to 3,000 triangles in a scene at 60 hertz, you're still looking at about 100,000 triangles a second. And we have games that are coming that are three to four times that on a PC today. There's no question that game would be a simple port.

***boot** So does* Mario 64 *deserve all the accolades it received?*

Sellers Well, as much as we believe graphics are a very important part of the game, game play is still number one. Interactivity. Is it fun? We see games on our hardware that are beautiful eye candy, but they aren't any fun to play. So they make great demos for us, but they're not going to be huge.

Mario 64 was a wonderful game because it had decent graphics, but mostly it was the game itself. People liked to play the game. As long as the graphics are good enough, it just comes down to, Are you having fun? And there's no question they did a wonderful job in that regard.

***boot** With PC's hardware acceleration, do consoles have a future in gaming?*

Sellers Absolutely. Microsoft is standardizing PC components to make it user-friendly, but the PC still has a huge fragmentation problem. Think of the matrix of all these different boards and processors, ranging from 486s all the way up to Pentium-IIs. And looking at that N-dimensional matrix, there's no way to really optimize a product. You just make these great generalized assumptions and, you know, it can be good.

There's a huge advantage if you are porting to a platform where the installed base is identical. From unit 1 to unit 30 million, the console hardware is identical. The QA effort is much, much easier. The performance, depending on the platform, may be some fraction of that of a PC, but you can really focus and optimize the heck out of it.

***boot** Which one console title ported over from the arcade machine would you most like to see running on a 3Dfx board?*

Sellers *Rush* and *Mace* are happening and they're going to be great. Getting *VF3* on our hardware... hopefully will happen. It will be beautiful on our hardware. We take a lot of pride in this not being a dumbed-down version of the arcade original. This is the real thing, and in some cases better. And that's the goal, and that's never been possible.

***boot** Does it bother you that most arcade conversions have been really lame?*

Sellers Completely, because it diffuses the message we're trying to tell people, and the consuming public gets jaded by it, especially some of these early arcade ports on both the Playstation and the Saturn, which were just pathetic. They've gotten better, but there certainly is a huge gap in technology and performance between the arcade and the current generation consoles.

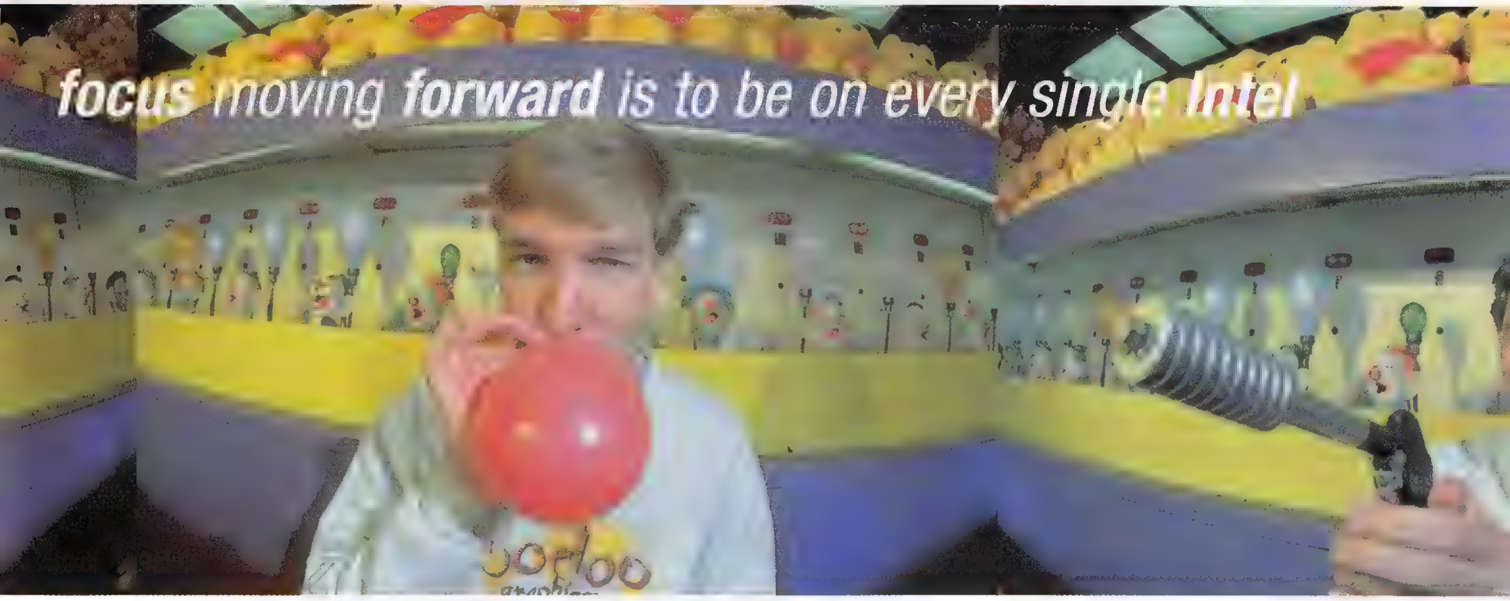
***boot** What about PC ports?*

Sellers We haven't seen many on the 3D side; in fact none that are shipping use hardware acceleration so far. There's stuff trickling in, but the arcade market is still very confused by the PC.

You're just starting to see a lot of the Japanese software companies going, "Oh look, we can put our game on a PC and sell another 15 million units worldwide." They're starting to clue into it now.

***boot** What do you think of Microsoft's Arcade Initiative?*

Sellers The "Arcade PC"—which now appears on their business cards—was a term we trademarked early during the inception of 3Dfx, so I'm glad that they've picked that up and they understand the concept. I'm slightly doubtful because there's a lot of things in the arcade that only people in the arcade business know. Such as the distribution model. And that's been


focus moving forward is to be on every single Intel
boolo

Personal Space

***boot** What kind of PC do you have at home?*

Sellers I don't have a PC at home. I'd never have time to use it. I have one in a box in my office that's ready to go home. It's not a name brand. It's just one of these build-your-own types of things. It's a Pentium Pro 200, 64MB, 3Dfx and Matrox Millennium, Adaptec SCSI card, Hitachi monitor.

***boot** So, what are you playing at the office?*

Sellers Most everyone around here still plays a lot of Quake. It's the only game I can say that I really play regularly. I try out everything, and I fly around and look at the graphics mostly. I played *Mace* quite a bit too—it's fun. Most of us just don't have time to really get into the game, unfortunately.

relatively unaddressed in the Intel and Microsoft Initiative, and that is exactly what the Williams and Segas bring to the world.

We absolutely support Intel and Microsoft in that. We're the reference hardware for that platform.

The content story is still very questionable. They have a few people lined up, but I don't understand Intel and Microsoft trying to make content decisions. That's a recipe for disaster, right? You can't go out there and try to predict who is going to be successful and who is not going to be successful. The best thing Intel and Microsoft can do is to create a foundation and a mechanism to allow developers to make decisions on their own. But they're out there now paying money to people. And that's just not going to work.

***boot* Why do you think there's so much lousy content?**

Sellers For the same reason there are a bunch of lousy movies. Creative thought is difficult, and it's not something you can buy with money. It's a very intangible thing and that's what games are all about—something new, something different, something unique, something fun. And that's exactly the same problem that Hollywood has, and it will always be a problem moving forward. There will always be terrible movies, there will always be terrible games, there will always be wonderful movies that surprise the heck out of me... and the same in games.

***boot* Who wrote the original GLIDE driver?**

Sellers Brian Hook, who is now with id, and Gary Tarolli, our chief scientist.

***boot* It takes a special mind to do 3D design. What special traits must one possess to do it right?**

Sellers This is like a college interview question!

***boot* Pretty much.**

Sellers Actually the ability to understand 3D and really conceptualize it and make it work is a strong foundation in mathematics. That's what myself and Gary Tarolli—3Dfx's other technical founder—studied growing up and what we really understand. 3D is really just a set of complex mathematics which have been known for centuries. So we're not necessarily re-inventing anything. We're just figuring out ways to implement it very efficiently, and greatly accelerate what's typically been too much math for traditional CPUs to operate in real-time.

***boot* What's your background?**

Sellers I went to Princeton for four years, got my undergraduate there, and then my first job was at Silicon Graphics. I worked on the Indigo line, the Indy line, some of the technologies that were eventually used in the set-top project with Time-Warner. I was one of the architects on that project.

Then a group of Silicon Graphics executives went off and started Palucid. This company was trying to do very low-cost niche workstations. Palucid was subsequently acquired by MediaVision, the sound card company that crashed and burned. Right when they were crashing, the group from SGI had some ideas about 3D graphics, so we decided the time was right to leave MediaVision and do this.

***boot* Who were 3Dfx's other founders?**

Sellers Gary Tarolli, the chief scientist in the company, and Ross Smith, who has subsequently left to found Quantum 3D. Ross' experience is in business development and sales and marketing, so he was vice-president of sales and marketing while here at 3Dfx.

So, in the early days, Ross was busy putting together the business plan and conceptualizing how to actually make money with something that didn't really exist in the PC yet. That was the trick. We wanted to do something very, very different where we could hire bright people, and everything we focused on was all new, different, and pure value-add to the end-consumer who would eventually buy this thing.

So we worked on what we originally called the arcade PC, primarily developing chips for the arcade market. It was all about real-time 3D graphics. It was all about very high-quality. We looked at what was out there from Sega and Namco, and said, "This is the bare minimum of what's acceptable." We wanted to raise that by an order of magnitude, and make it much more cost-effective.

"Development times are so **long** because now we have graphics **chips** that are multiple **millions** of transistors each, which is **CPU** size."

But we architected it so it could plug into a standard off-the-shelf PC. We realized that the hottest games sold in the home usually originate in the arcade. So getting that technology to arcade manufacturers, letting them understand our pixel pipeline, how to program to the chips—that will get the hottest content developed on our hardware first. When Sega goes from its model 2 or model 3 and tries to migrate down to the Saturn, it's a complete rewrite. Well, our chips are scalable. It's exactly the same code that then runs on the cost-effective solution for the PC. Some arcade games have already been ported in literally a week. Now arcade customers say, "Wow, I can get this thing into the home immediately." From our customers' perspective, there's no quality difference between the two, and it's a real nice synergy.

***boot* What games have been ported from the arcade?**

Sellers Well, all the Atari games currently shipping are in one form or another on their way to being home versions as well. At E3, I was looking at *S.F. Rush* on an Ultra 64, and it's a remarkably different game. It looks blurry. It looks like a console, and yet if you see it on our PC version, it looks better because it's a high-resolution monitor. The processor in a PC is even faster than what they're using in the arcade, which is almost unheard of for a port.

***boot* Where do you find people to develop for GLIDE?**

A lot of the software engineers we hire, especially in the early

Macs Kick Ass

***boot* What add-in game deals are on the table currently?**

Sellers [illegible] Apple partner, and [illegible] PC version also.

***boot* Why are you moving into the Mac market in Apple's darkest hour?**

Sellers [illegible]

***boot* Does the Mac platform have any advantages over the PC?**

Sellers [illegible] PowerPC. [illegible] Mac has always been [illegible] friendly than the PC. [illegible]

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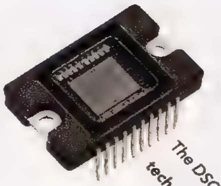

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days, were pure hackers. They coded 3D because they loved to code 3D, and they loved to play, and they loved to program. And we wanted to tap these people. You can't tap them with a formal developer relations program where you go out and find these people and give them boards and sign them to your total immersion developer support program. You really can't find these people. You just hope they find you.

And by releasing GLIDE publicly on the Web and creating our own newsgroups for almost-real-time Q&A, thousands of students and part-time programmers can get up and start writing for 3Dfx. There are now web pages by individual users developing games for Voodoo Graphics, and there's all these little game demo snippets from people you've never heard of. And that truly is unique. There's no one else that's happening with.

***boot* Do you feel that's a sign of success?**

Sellers It's a sign of validation from the gaming and the programming community that they like our technology. We receive hundreds, if not thousands of e-mails every week saying, "It's crazy. You have changed my life. I can't believe how I look at my PC differently because of your board." It's extremely satisfying to us to see that they're really, really happy with the $150 or the $200 they spent on the board.

***boot* What's the biggest complaint you've heard from your customers?**

Sellers That it takes two PCI slots. And that's the power users. Do people really put other things in their PCI slots, anyway? Power users do. They load-up with a brand new SCSI board and maybe even a PCI audio board now, and taking that other slot is limiting. So that's one complaint.

The other complaint is not being able to do 3D in a window, at least for Voodoo Graphics. But you can with Voodoo Rush.

***boot* What about Direct3D versus OpenGL?**

Sellers We try to stay away from the API wars because we see ourselves mostly as a delivery vehicle for content. If the developers are demanding Direct3D—which they have—we will absolutely support Direct3D. And we have, from the very beginning. We have a team of engineers whose goal in life is to make sure our Direct3D driver is the fastest and the most solid in the world. Our developer support team is there literally 24 hours a day answering questions on how to make their game as good as possible using Direct3D on our boards.

OpenGL came out of nowhere and no one expected OpenGL to gain momentum as a gaming platform. *Quake* changed all that. And when we started talking with id, and they wanted to use OpenGL, well, they're demanding we support this other API. So we accelerated the engineering work of getting it up and running, and it's all history at this point.

We're really API agnostic, for lack of a better word. It's just a means of final delivery and we'll support what the gamers are asking for.

***boot* So if a third as-of-yet-unannounced API came out, you guys would support that as well… if that's what the developer's wanted?**

Sellers Absolutely. It's like GLIDE. The world does not need yet another API, right? However, it serves a purpose. It is the cleanest and fastest and easiest way to get something up and running, and using all the 3Dfx accelerator's features that OpenGL and Direct3D do not support. And developers continue to, in large voices, ask for GLIDE because what takes 100 lines of code in GLIDE takes 2,000 lines of code in Direct3D. We are not in an API war against Microsoft, but we will continue to support what the developers want.

***boot* What are the relative weaknesses of both OpenGL and Direct3D?**

Sellers Performance has been a huge problem with DirectX—there's no question about it. The whole concept of execute buffers is oriented towards a software rendering model, and very difficult to port for hardware acceleration. The documentation historically has been terrible. The technical support has been terrible. The intuitive nature of the interface has been very, very difficult to use. And just in terms of the API's elegance, as I said before, 2,000 lines of code to get a triangle up and running on the screen is ridiculous.

With the developers' OpenGL letter, Microsoft realized they were not doing the right things and DirectX 5.0 has made it easier. They certainly improved their documentation. They fixed some of the performance issue. So they're making inroads.

The problem with Direct3D is that there are no extension capabilities, and it's still a fairly generic set of 3D features. We have a wealth of pixel pipeline processing features we can accelerate that are proprietary and unique to our hardware, and there's no way for a developer to use Direct3D with some of these more advanced features. Microsoft has put new things in DirectX 5.0, and those new features are incorporated, but these were still a few years behind GLIDE.

One of the advantages of OpenGL is the ability to add proprietary extensions. Adding that to Direct3D would definitely solve some of the limitations that it currently has today. It needs to be simpler to use, there's no question about that. And whether that's technically possible is a whole other issue, but it needs to be cleaned-up. They have so many legacy issues to account for in the DirectX API that they can't just clean start from a clean interface. I understand technically why they had to do some of the things, but it's unfortunate because, in the end, it hurts the consumer, and it dramatically increases the cost of the game port to Direct3D, and it certainly hurts time-to-market when you're not able to buy the thing. And in the end it costs the consumer dollars, because all this stuff costs the publisher dollars.

Microsoft has a challenge. It is a very real and sometimes difficult to solve technical challenge. So if Microsoft continues to support DirectX, it will be a major API that developers will support. It's just taken longer than anyone wanted.

***boot* Do you have faith in Microsoft to fix DirectX?**

Sellers Yes.

***boot* We understand 3Dfx asked Bill Gates to kill Talisman. Why?**

Sellers [laughs] Well 3Dfx absolutely did not

Best Face Forward

***boot* Which games best shows off the 3Dfx hardware's abilities?**

Sellers *Quake* certainly uses a lot of the features that we talk about. And that includes full scenes debuffering, output blending with no performance penalty, and colored lighting is coming in *Quake 2*. And in some of worst case areas in *Quake* you'll see over 10,000 polygons in a scene. So that definitely pushes our hardware.

Out of the Void from GameFX, while not a shipping game, certainly uses a lot of exciting techniques in terms of output blending, lots of translucency within textures, lots of different texture formats—we support 14 while most of our competitors support three or four. There's lots of different effects you can do just by using different texture formats. They're using some compressed texture technology that we have been slow to evangelize. *Quake* was created to run on an 8-bit system. So the GameFX guys said "Look, we're going to start with hardware in mind. Everything is going to be 32-bit RGB to start with," and as a result you can really see a difference in the fidelity of the image.

Mace is another good example of what really pushes our hardware and uses a lot of the advanced features, again starting with very high-quality art. Every texture in *Mace* is compressed, which is the only game I can say that about. That texture compression technology has been in our hardware since day one.

ask Bill Gates to kill Talisman. We would not take a position such as that with Bill Gates.

***boot* You know, we might actually even have an e-mail on that...**

Sellers Talisman has extremely good visual quality, no doubt about it. Being able to anti-alias without asking the developers to do anything other than turn on a bit. To do translucency without sorting objects. Even our hardware today, even if you've fully debuffered a scene, you still need to draw translucent objects so they blend properly. And that restriction is removed in Talisman.

The texture compression is very interesting. But most of these technologies we were working on anyway. When we saw Talisman, it was a check marker, "Hey, we're going in the right direction here."

Developers never have enough texture memory. If you list the 10 commandments of developers, high up there they always want more texture memory. So Talisman's compression texture technology allows developers a lot more effective texture memory.

I didn't like that Talisman was a whole different programming paradigm. We, and everyone else in the graphics business with the exception of PowerVR, had been evangelizing a traditional way of understanding a 3D pixel pipeline and how to process it. That's important, not only from the run-time environment, but also in the content creation side when you're developing the art and the core game engine at the very high level. Even if you're developing on Silicon Graphics workstations or whatever, it's important to have a consistent programming paradigm from the top down.

Talisman really went off in left field, and that was very disturbing because it creates a great fragmentation in developers' minds. Plus, the cost was never anywhere close to being cost-effective.

Performance was not very interesting either. Yes, you can make an argument about these on-the-fly transformations where you don't actually render everything in the scene again. The problem is that the "usual cases" don't matter in 3D; it's the "worst case" cases you have to understand and design around. If you're moving around in 60fps, and suddenly turn around a corner and it drops to 2fps, you've taken the user out of the game. Now they remember that they're sitting in front of a computer and they're not really in the *Quake* environment. What happens when you open a door and there's a whole new environment behind that door? Well, Talisman resorts back to rendering the whole scene and the number of triangles they can process is very low. Their fill rate maxes out at 40 mega-pixels a second, which is lower than ours today—and it's just not compelling anymore. Actually, they were targeting 1024 or higher resolution, which really means they're a factor of four lower than where we are today since we're at 640x480 resolution. The developer will never program around that.

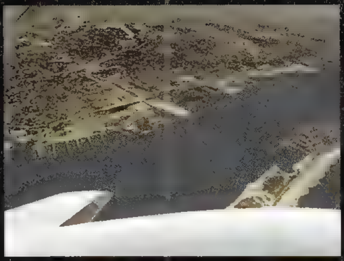
You have to have consistency, and that means designing around worst-case corners. Talisman has more worst-case corners than any architecture I've ever seen.

***boot* So Talisman is dead?**

Sellers Well the official word from Microsoft is that the reference platform has been cancelled. a lot of the technologies developed for Talisman—such as texture compression, such as full scene anti-aliasing, such as non-sorted transparency—those technologies will find their way into mainstream products using traditional 3D pixel processing techniques. ▮

Next Month *we continue our conversation with* ***Scott Sellers****, where he talks about the company's next-gen 2D/3D card codenamed Banshee, and explains why Voodoo Rush disappointed him. And he goes off on those who would vex 3Dfx, equating games running on Oak's new chipset to Myst, and accusing the PowerVR people of lying and cheating. Regarding 3Dfx' recent fall-out with Sega, Sellers says, "Sega has not demonstrated in recent years their ability to make good, sound decisions, and it now seems they're likely to continue their streak of poor products." Be here to hear him back it up!*

"3D is really just a set of complex ***mathematics*** *which have been known for* ***centuries****. We're* ***figuring*** *out ways to greatly* ***accelerate*** *what's typically been too much math for traditional* ***CPUs****."*



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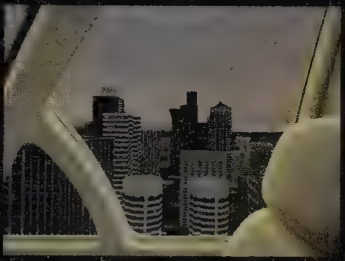

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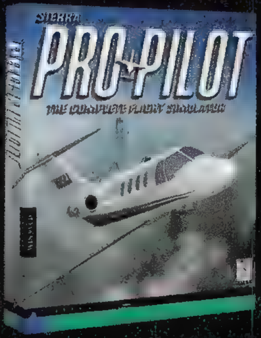

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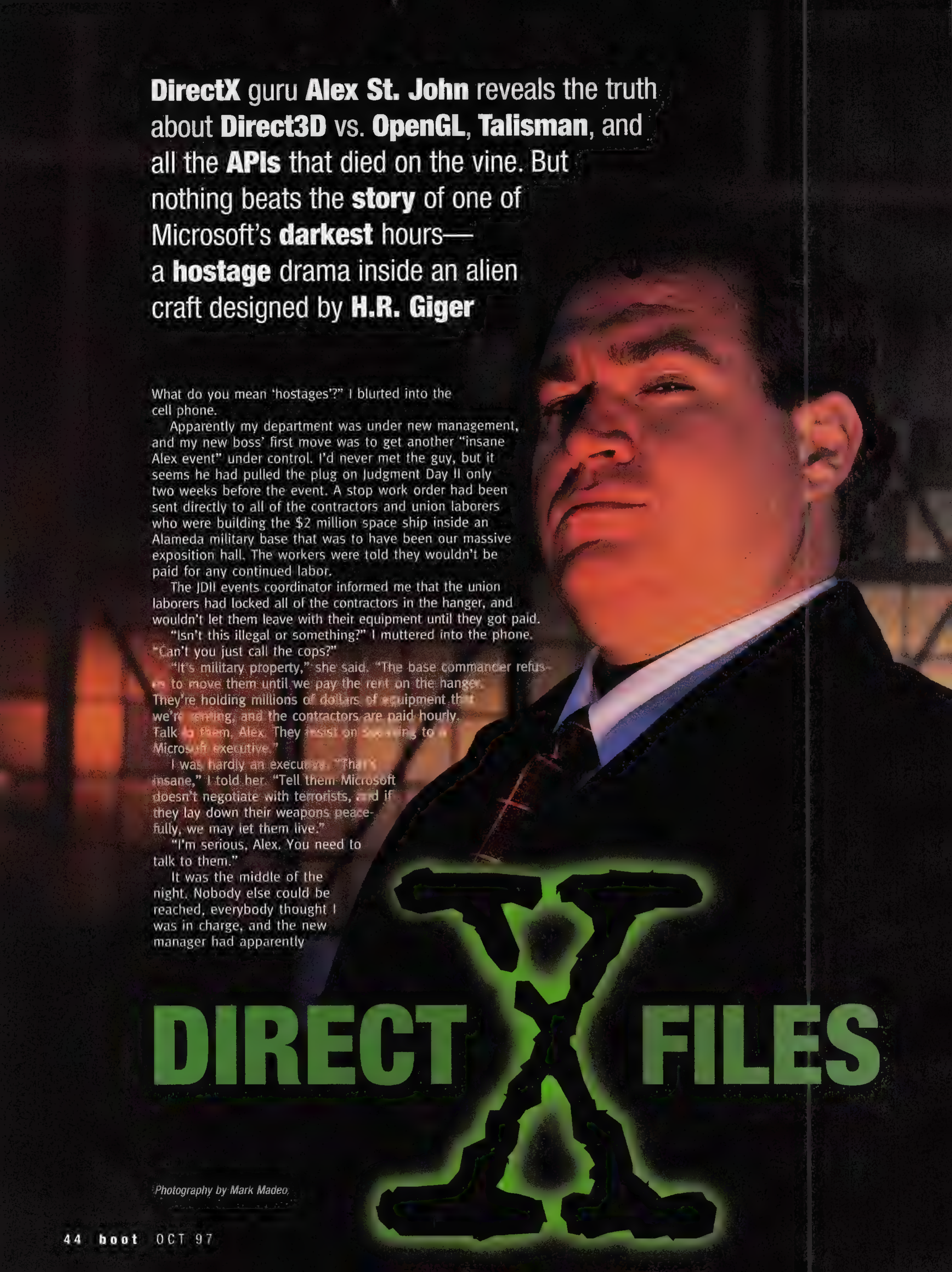


DIRECT X FILES

DirectX guru **Alex St. John** reveals the truth about **Direct3D** vs. **OpenGL**, **Talisman**, and all the **APIs** that died on the vine. But nothing beats the **story** of one of Microsoft's **darkest** hours—a **hostage** drama inside an alien craft designed by **H.R. Giger**

What do you mean 'hostages'?" I blurted into the cell phone.

Apparently my department was under new management, and my new boss' first move was to get another "insane Alex event" under control. I'd never met the guy, but it seems he had pulled the plug on Judgment Day II only two weeks before the event. A stop work order had been sent directly to all of the contractors and union laborers who were building the $2 million space ship inside an Alameda military base that was to have been our massive exposition hall. The workers were told they wouldn't be paid for any continued labor.

The JDII events coordinator informed me that the union laborers had locked all of the contractors in the hanger, and wouldn't let them leave with their equipment until they got paid.

"Isn't this illegal or something?" I muttered into the phone. "Can't you just call the cops?"

"It's military property," she said. "The base commander refuses to move them until we pay the rent on the hanger. They're holding millions of dollars of equipment that we're renting, and the contractors are paid hourly. Talk to them, Alex. They insist on speaking to a Microsoft executive."

I was hardly an executive. "That's insane," I told her. "Tell them Microsoft doesn't negotiate with terrorists, and if they lay down their weapons peacefully, we may let them live."

"I'm serious, Alex. You need to talk to them."

It was the middle of the night. Nobody else could be reached, everybody thought I was in charge, and the new manager had apparently

Photography by Mark Madeo

DIRECTX FILES

issued the stop work order from Comdex, then vanished into the throngs.

This marked the beginning of one of the strangest dramas in Microsoft history, a drama that has been successfully hidden from the press... until now. Laborers were being held hostage on a military base by a Microsoft budget decision. A spaceship designed by H.R. Giger would lay dormant forever.

Of course, the DirectX Files are rife with secrets that have been hidden from the public eye. Sometimes reporters don't know where to look; sometimes they ask the wrong questions. But the truth is out there. The truth about Direct3D versus OpenGL. The truth about Talisman. The truth about the event that was to be the grand celebration of DirectX gaming.

The first Judgment Day had a Halloween theme; the second would be alien abduction. We rented an abandoned military base in Alameda, CA, and hired H.R. Giger to design an alien ship to be constructed inside the base. The plan was to hold a developers' conference at a local hotel, and during the last session of the event, black-suited G-men with machine guns would burst into the conference, and load everybody onto buses at gun point.

The captives would be transported to the military base/alien ship in black cars with motorcycle escorts. After being frisked by guards, they would be lead by banks of computers and suited lab technicians to the ship entrance. From here, they would travel down a long tracheal passage steaming with eerie mist and dripping goo, and then make their way into the main trade show area.

continued on page 50 >

The Birth of DirectX

Defining the trademarks of a "true" DirectAPI

The key question I posed to game developers in the early days was, "What could Microsoft build that would make you move to Windows?" They all dodged that question, and instead responded with a series of very reasonable complaints: Windows is too big and slow. It gets in the way of everything. It sucks up 20 to 30% of the CPU. It eats most of the available RAM. Its APIs impose too many layers of indirection to go fast. It does little to solve the installation and compatibility issues everyone suffered from under DOS.

My question didn't lead to much constructive input, so the follow-up question was, "What are the biggest problems with the PC for game development?" The answers were clear: Support issues for DOS content were huge. Installation procedures were random. Drivers were homegrown. A lack of standards meant lowest-common-denominator hardware support, so that even when great new game hardware was introduced, it was almost impossible for it to get adopted. Prior to Windows 95, VGA 320x200 was the standard game graphics resolution. VESA drivers were trying to make an inroad, but like all uncoordinated driver efforts, VESA drivers could barely be counted on for even basic graphics functionality.

"Windows is too **big** and **slow.** It gets in the **way** of **everything."**

We reasoned that if we accomplished the following objectives, DOS would be dead, and Windows would become the de facto gaming platform:

- Push the operating system out of the way in every instance in which it might impede real-time performance.
- Make a broad suite of powerful multimedia drivers that mapped as closely to actual hardware functionality as possible, and supported a much larger range of functionality— but not extensibility—than before.
- Standardized hardware identification, game installation and launching.

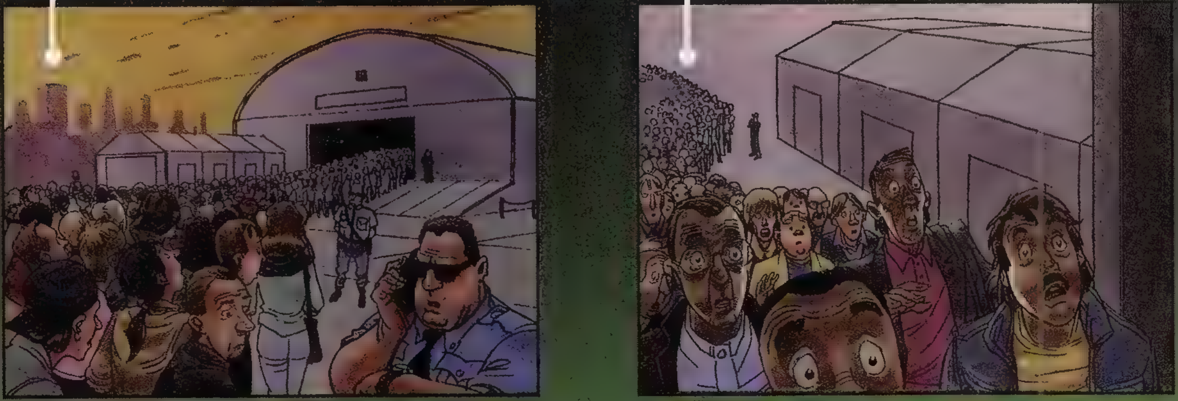
Layered API architecture is a root source of power and flexibility in an operating system. Every modularized layer of functionality acts as a virtual joint where the platform can bend and flex to accommodate new innovation. It is the layering of Windows APIs that is a key component to the OS' power. Consider an application such as Excel. The user's interaction with this program is mapped through several layers of abstraction before it reaches hardware: Excel, Graphical Device Interface, Device Driver Interface, video hardware.

This architecture provides four layers of freedom in which innovation and evolution can take place. As long as each layer remains backwards-compatible, it can grow and evolve freely without requiring the re-authoring of other layers. For applications that don't have a real-time requirement, the idea is great. But for apps that need to go fast, layering means abstraction, and abstraction means slowness and disruption to real-time pipelining.

One of the great challenges in creating DirectX was to bring the benefits of layering—abstraction, device independence, consistent programming model—to gaming, while minimizing any negative impact to performance. The other major challenge was to essentially jack the whole operating system up on blocks, rip out its old driver foundation, replace it with a modern one, and extend it. We would then gently set down the whole monstrosity without breaking anything. There was a great deal of skepticism within Microsoft that this was possible. The means by which the above is accomplished is the trademark of a "true" DirectAPI.

How a true DirectAPI is made:

- Identify the common functionality among both major and leading-edge hardware brands. For 2D video, for example, we take the shipping video cards from the leading vendors and the hardware prototypes from the promising upstarts, compare all the shared functionality, and try



This original storyboard drawn by the creators of *Drowned God* illustrates the opening experience planned for Judgement Day II attendees. Later in the event *X-Files* stars Gillian Anderson and David Duchovny were to award prizes to the tournament champions.

2,500 people are abducted and herded into a vast aircraft hanger

An astonishing site awaits them.

OpenGL vs. Direct3D

The **truth** about the **so-called** 3D API war

The real 3D war is not between APIs, but between Microsoft and Silicon Graphics—or in many cases between Microsoft and itself.

Bill once coined a term to describe Microsoft's relationships with other major competitors: "cooperatition," the act of being locked in mortal combat for market share with another company while simultaneously working together on mutually beneficial projects. That is the state Microsoft and SGI have been in over 3D for the past four years.

Microsoft licensed SGI's OpenGL API specifically to enable SGI's leading independent software vendors to migrate their applications to NT. SGI, meanwhile, gained Microsoft's acknowledgement of OpenGL as a standard in some markets. The developers involved in the API "war" are being used as pawns on a political battle field that has little to do with technical purity.

Microsoft knows SGI is collapsing and will shortly become irrelevant. One of the primary reasons Microsoft has been happy to support OGL at all has been that SGI is perceived as a minor threat. If developers start screaming for OGL, it tells Microsoft that SGI has become a competitive threat (albeit a minor one), and thus supporting OGL becomes support for SGI, which is no longer acceptable. Rest assured, Microsoft will kill it for strategic reasons.

Microsoft has won a thousand platform API wars; it knows how to win this one, too. SGI is following in the predictable tracks of many failed contenders. There is no money in SGI selling PC game APIs, and it hardly has the kind of experience Microsoft has in making drivers work (or not work). Ultimately, SGI's consumer 3D API offering will be traded as a bargaining chip when the time comes to do a deal with Microsoft to prolong survival. Until then, it's important for SGI to make that chip as valuable as possible.

The secret evangelism war waged between these companies is often well-hidden from public view, and rarely shows the true nature of the politics involved—at least, until somebody makes a mistake. Check out the beginning of this accidental public posting from a senior guy at SGI, with whom Microsoft execs are trying to negotiate 3D API détente:

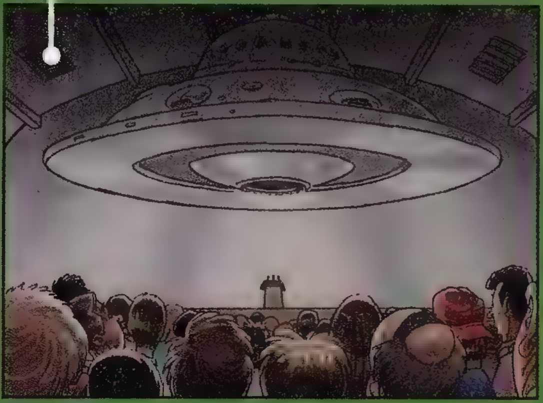
From: John Schimpf [SMTP:jscn@giraffe.asd.sgi.com]
Sent: Friday, August 01, 1997 9:32 PM
To: Multiple recipients of list OPENGL-GAMEDEV-L
Subject: OpenGL at SIGGRAPH
Shawn, Can you send the following to the e-mail address? This is the OpenGL game developer list. OPENGL-GAMEDEV-L@fatcity.com. I'm trying to keep my name out of view of Microsoft. I sent a similar posting to the general OpenGL newsgroup.

Alex St. John stands before an aircraft hanger at the Alameda Naval Air Station where the space ship was to have been constructed.

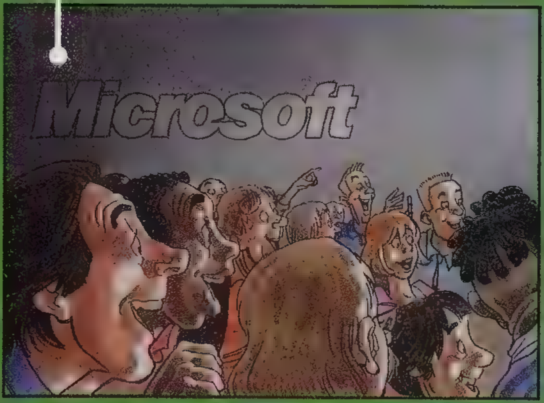
The content of John's letter has been left out for brevity's sake, but as you can see, he isn't playing with all of his cards on the table.

With Microsoft's disparate 3D teams finally unified around one 3D driver model, Microsoft is finally in position to innovate productively in 3D again. Observe that the *only* aspect of OGL that Microsoft has decided *not* to continue development for is the name. Any OGL functionality developers want will doubtlessly be supported by the new D3D. It is the mindshare that SGI owns though the OGL name that must die, not any of the valuable technology.

Many of the biggest performance problems attributed to D3D are the result of busted drivers, not the API. Brokenness is the inevitable result of hardware vendors having to support multiple driver APIs as well as creating their own. There is little chance that games written to SGI-provided OGL drivers will install better, or run more reliably across a broad range of consumer 3D hardware. It will be just as broken as D3D, because the API is not the fundamental problem.



...a vast UFO, hovering



Laughter at the brazen showmanship of Microsoft

Microsoft's **ill-fated** journey into **3D** hardware

The Talisman 3D chip is one of many stillborn technology initiatives birthed by Microsoft's defunct Advanced Consumer Technology group, a body created by Nathan Myrhvold to advance the leading edge of consumer interactivity. Like many of Nathan and his Ph.D contemporaries' great ideas, its implementation fell very short of its vision.

Talisman was designed to surpass anything else on the market for sheer rendering performance and quality. The purpose was to standardize 3D hardware on a Microsoft-controlled reference design, and force the PC to take a huge leap in 3D leadership.

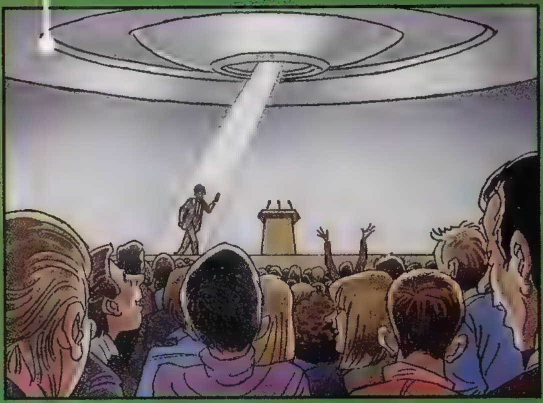
Unfortunately a "cool" idea alone is rarely sufficient to capture a market. Hyped to the press long before a working prototype of the chip could be manufactured, or before test drivers could be built, the much-ballyhooed design will be obsolete by the time it ever appears in a real chip solution. What's more, the individual ideas it touts as leading-edge have already evolved in the 3D chip business without Microsoft's help. The original Talisman chip, before it was dumped by Cirrus, was four times more complex to build then any chip Cirrus had ever made before, and required more transistors to implement than the Pentium Pro.

One of Talisman's promises was that it would make 3D hardware more consistent and easier to write drivers for. But it would really just force leading-edge chip makers such as 3DFX into the position of having to compete with Microsoft. Meanwhile, the industry's worst 3D chip makers would be free to creatively interpret the Talisman spec, and implement a thousand different mutant variations of the technology—each new mutation a real-time performance balancing hell waiting to happen.

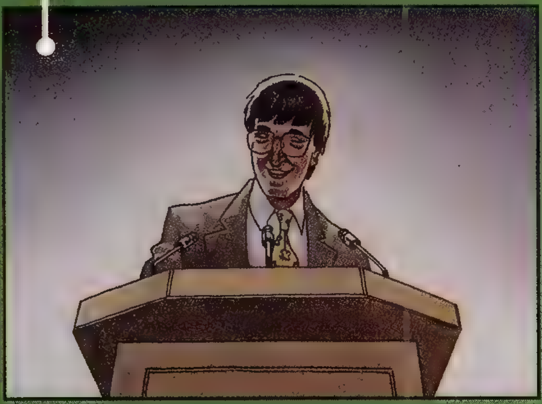
The peculiarities of authoring for the chip required content developers to dramatically alter the way they built 3D engines and content. Although the chip was capable of tremendous theoretical performance, its worst-case performance scenarios were very common to many modern 3D game engines, such as *Quake*.

The merger of the D3D team into the Talisman team shortly after D3D's second release contributed heavily to the API's degeneration; the priority shifted from serving developer needs to jamming support for Talisman features into the API. Hardware vendors wanting to work with Microsoft to enhance D3D and develop better drivers felt they had to become Talisman licensees. Those who couldn't work with Microsoft (or wouldn't for business reasons) could no longer reveal their plans for future 3D chip architectures to Microsoft for fear that they were revealing secrets to a competing chip maker. D3D became a carrier for Talisman technology rather than the industry demand-driven API that it needed to be.

The recent death of the Talisman chip, and the merger of the D3D and OGL teams, may bode well for Microsoft finally getting it together on 3D. But it's going to be interesting to see if the ex-Talisman guys now in charge of DirectX set aside their religion to focus on the needs of the software and hardware community.



Bill Gates appears on stage

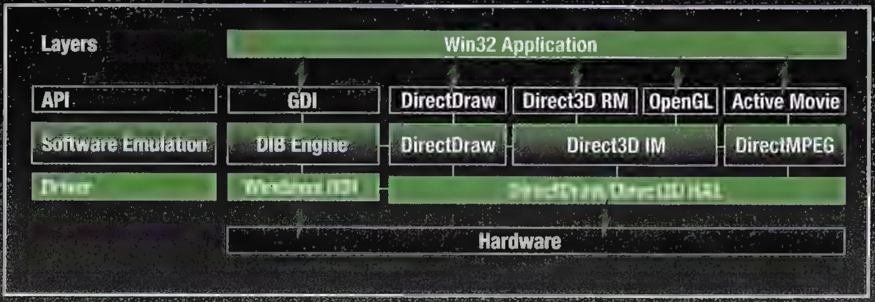


He begins his welcome speech

ADMIT ONE
Judgment Day II
11-11-96

to support everything that two or more competing vendors are shipping, or are about to ship. Unless it's just a useless idea.

- Ignore support for next-gen hardware functionality until game developers demand it, not when hardware companies request it. About 90% of the "exciting next-generation ultra-nifty" hardware features we hear about never make it to market. And if they do make it to market, without independent software vendor support, they fail. Therefore, instead of wasting development resources on trying to anticipate demand for functionality that will probably never materialize, we focus resources on getting support just for hardware functionality we know software vendors are committed to using.
- Extensibility is not allowed. Instead, Microsoft must keep its finger on the pulse of developers, and innovate aggressively. Extensibility is not allowed because it can't be tested or certified. Extensibility, as desirable as it sounds from a free-market innovation standpoint, does not work in practice. It just results in more broken drivers and support headaches.
- Map as intimately to the hardware as possible; abstract only where absolutely necessary (such as making all video memory look linear). The more work an API does, the slower it goes. The surest way to ensure that Windows is fast enough for games is to place the smallest amount of Microsoft-supplied code as possible between the game and the hardware.
- Provide imposition-free emulation in the API; prevent any emulation in the driver. Software emulation for hardware functionality can be useful for many applications, and should always be provided for applications that don't have a real-time requirement. However, in games, software emulation steals CPU cycles—without the game being able to control the process or know how much CPU fluctuation will be caused. Thus, a DirectAPI has emulation, but allows the game to control when it is used. Software emulation in a DirectX driver is taboo. To trick journalists and pass benchmarking tests, hardware companies love to jam software emulation into their drivers for functionality their hardware doesn't actually support. Doing this always busts the driver, and screws up the real-time balance of a game.

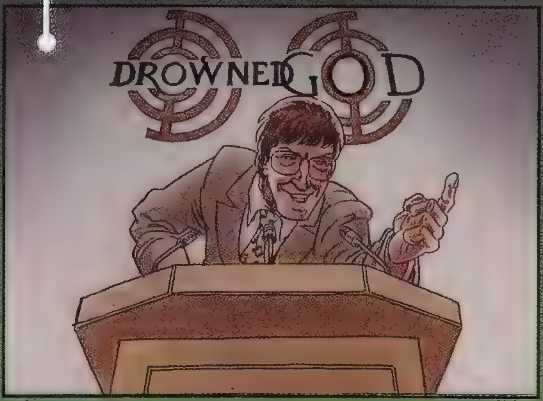


An original DirectX architecture diagram as presented by Microsoft at the 1996 Computer Game Developers' Conference. It clearly shows the layered API strategy and Microsoft's original plans for OpenGL and DirectMPEG. MMX optimizations occur in the software emulation layer.

- Install and upgrade safely; drivers must work. The ability for PC hardware to evolve continuously is one of the platform's most powerful features; it is what sets it apart from the consoles. But successful evolution is a very fragile thing. Evolution doesn't occur without a medium to travel in. If the medium of evolution breaks down at any point, it fails. The transition between one driver and another is one of those fragile junctions that the PC has never succeeded in stabilizing. For installations and upgrades to work, applications must be able to trust that they will work with code they have never been tested on. This demands a great deal of responsibility from the OS and driver creators. Too much apparently.

The other pieces of functionality necessary to completing the DirectX vision can be found in Autoplay, and in the family of DirectX APIs that never made it.

...corporate statistics, new products, continual growth



The Drowned God theme swells, and he talks of the origins of mankind, the new world order...

> continued from page 45

When the plug got pulled, we were expecting 3,000 attendees, 400 developers, 50 vendors, lots of game companies, press and gamers to converge on the base. Somewhere at Comdex, a man I'd never spoken with sent the order to cancel Judgement Day II. I was later told that the event was way over budget, and that at the last minute the PR department decided they couldn't deliver the necessary media attention.

Now I was calling John Walker, president of an event production company called Area 51, to discuss a "hostage situation." He answered cheerily enough, and explained that since Microsoft had told them they wouldn't get paid for any more work, the union guys refused to let the contractors move their own equipment out. The terms of the contractors' insurance policies required them to stay with their equipment, and the base contract required the facility be kept locked at certain times—therefore, they all allowed themselves to be locked in the hanger together. John said they weren't brandishing weapons, but there was no telling how union guys would react to having their jobs usurped. Sounded like an implied threat to me.

Walker said he wanted $270K up front. I told him the executives who could rustle up that kind of money were busy at Comdex canceling events, and were unreachable. "It seems to me that I owe the contractors locked in the base a lot more money then I owe you, so if I refuse to pay you, you'll keep them locked up indefinitely? Sounds like a deal to me." He didn't appreciate the irony.

He suggested that he could cause an embarrassing media situation for Microsoft. In retrospect, I'm surprised a three-day hostage situation got no press at all, but this would be the same media that missed the eight-foot tall penis monster at the first Judgment Day. I could see the headline news:

Microsoft denied all association with a reported flying saucer stored in a secret hanger at the Alameda military base today. Sources close to Microsoft say the SWAT teams surrounding the base were merely there to settle a labor dispute associated with a canceled event.

I just wished this had happened before the event was cancelled. If I plan any future mega-events, I'll make a point of annoying the unions before the party.

In the morning we had breakfast catered to the "hostages," and I managed to talk to the base commander. "So, do you allow civilians to take over sections of your military base?" I asked. The short of it was that we owed the base $60K for the hanger, which if paid promptly, would result in military police "resolving the situation."

I went to a Microsoft exec with the request for a fast $60K. I've noticed that when people are confronted with bizarre situations beyond their experience, they often deny that it's happening. He seemed happy to sign, just on the merits of having me go away with my crazy situation as quickly as possible. A day later the MPs swept in. I don't know if it involved marching away union guys at gun point, or splitting the $60K with John, but the situation was over.

The $2 million spaceship was torn down and moved to a nearby warehouse, where Microsoft pays rent on it to this day. My day was done. Not much later my days at Microsoft were also done. But ever since my decision to go public with this knowledge, I keep seeing the same nondescript black car with Washington plates in my rearview mirror.

Executed APIs

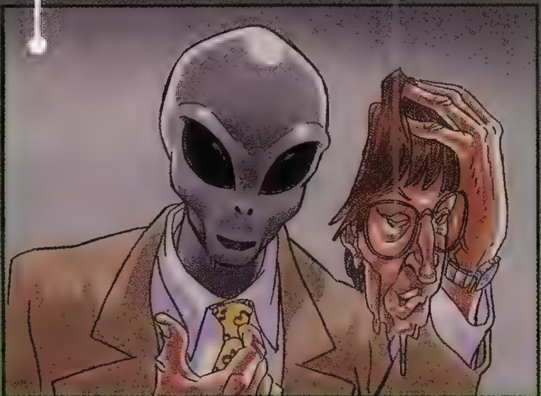
The **DirectX** componets you'll **never** see

DirectVR A couple years ago there were half a dozen little companies struggling to introduce VR goggles and flicker glasses. We figured that if we could write a standard VR driver model that game developers could support, these devices would have a better chance of survival. We were all very excited about the prospect of widespread adoption of VR technology, but the resources weren't there. DirectVR was never finished, and most of the original VR companies are gone now.

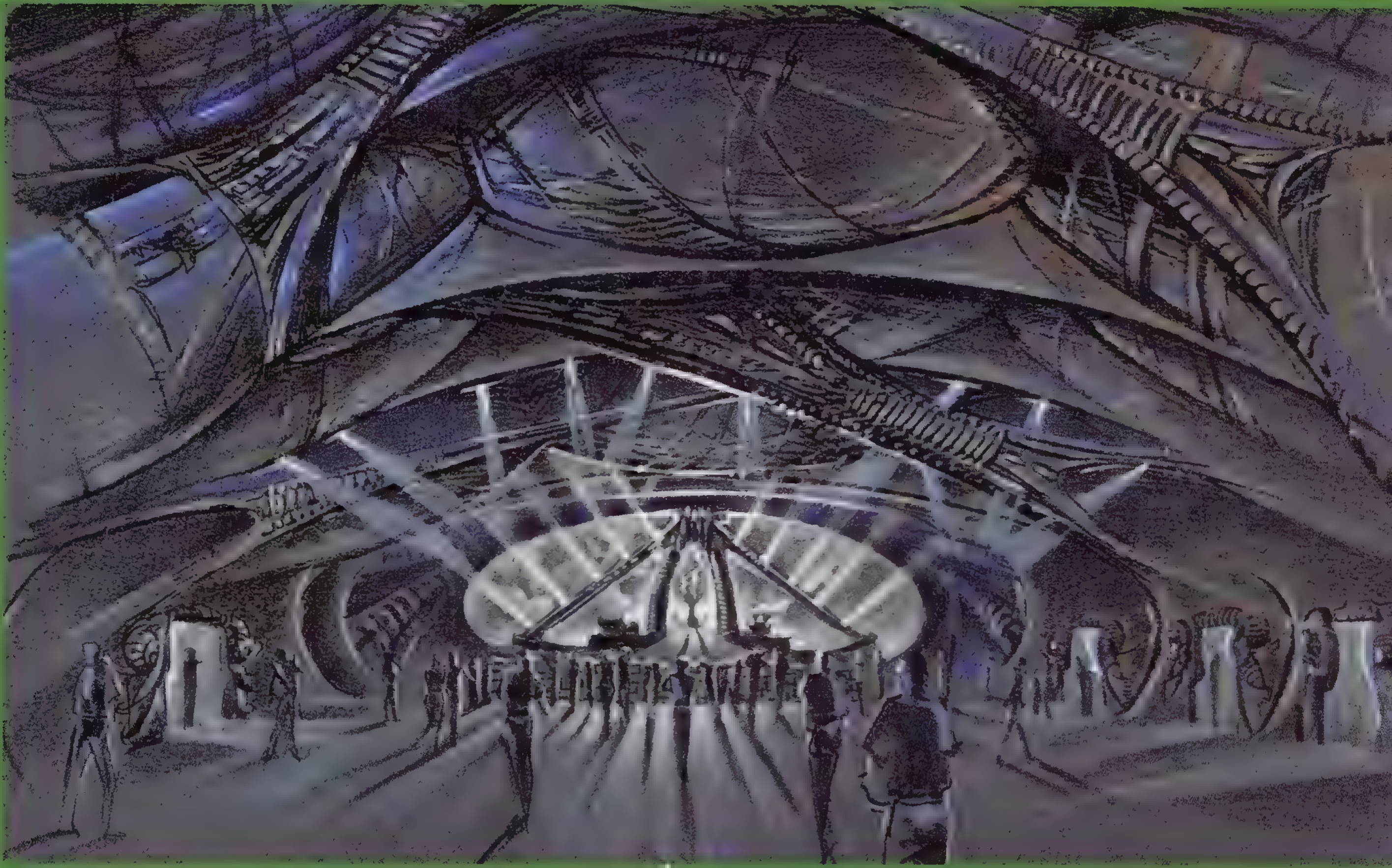
Like so many forgotten multimedia hardware revolutions, VR devices could never gather enough market momentum to become viable. When the venture capital was flowing, they all had their own SDKs and VR libraries, and they could all afford to do deals with publishers to support their particular hardware. But in the end, without some level of standardization that games could consistently support, the technologies couldn't take off.

DirectArcade Many moons ago, representatives from the Amusement and Music Operators Association, a consortium of coin-op machine vendors, approached Microsoft about creating an API that would allow PCs to become the de facto computing component for the arcades. They reasoned that if we supported a standard mechanism for taking cash, accounting over the net, lobbying game play, and downloading content on demand, they could create a market for coin-op content that wasn't dependant on buying proprietary machines that play just a single game. Instead of being dependant on a few Japanese suppliers for new content, the whole game industry would participate in the revenue stream. We thought this was a great idea, and created an ini-

"Allow me to introduce myself..."



Beneath the facade of Bill Gates is a grey.



This pastel by Spectra F/X depicts the finished JDII spaceship as originally conceived by H.R. Giger.

tiative with Intel to support it. But the resources to create the "DirectArcade" API weren't forthcoming. I was forced to tell the AMOA that Microsoft wouldn't build the API for them. Instead, I introduced the AMOA to Monolith, which did develop "DirectArcade." The AMOA will be looking for content, and deploying DirectArcade machines around the country shortly.

DirectEngine Microsoft's Interactive Media Division contracted Monolith to build a new game engine for them. Unfortunately, Microsoft decided the engine was way too cool to just give away as part of DirectX. It's now being used for several Microsoft titles.

DirectMusic MIDI support under Windows has always been awful. I won't detail the ways in which we butchered MIDI support, but, yes, the Mac guys loved laughing at us about it. DirectMusic was designed to solve all the latency problems of MIDI playback under Windows, and add support for MIDI patching, and other MIDI functionality games like to have access to. DirectMusic was well underway before the re-organization that moved much of the DirectX team under Deborah Black and Jay Torborg. I've heard very little about it since then. I'm afraid it may have fallen by the wayside.

DirectMPEG A desperate effort to save the MPEG chip market by adding support to DirectDraw for standardized MPEG decompression drivers. At the time there was enormous MPEG-1 enthusiasm, and a number of chip makers where shipping MPEG accelerators. Unfortunately, only rudimentary support for hardware decompression of MPEG existed in Windows. However, it could be done as an MCI extension.

The result was that no two MPEG extensions worked the same way, meaning nobody could ship a game with MPEG video that would work on all MPEG hardware. Each individual MPEG chip maker did individual deals with title makers to do special versions of their games that supported each vendor's proprietary MPEG extension. The result was no market for MPEG-accelerated video. Eventually software decompression surpassed it. The MPEG vendor community was pretty much dead and gone before we could get a standard driver model out to support them.

DirectCD DirectCD simply recognized that the disk cache was rarely a good use of working set memory for caching data from the CD. Single applications needing to use the CD can do a much better job of anticipating their data needs over a fat, general purpose, OS-provided cache. DirectCD merely turns off the cache, allowing the application to recover the RAM for its own good use. This simple gesture dramatically improves the performance of many multimedia titles. DirectCD was never written because, in general, the NT CD subsystem works much better, and many folks thought it would all simply be fixed in the gradual move toward the NT code base.

DirectMemory Memory management has always been one of the most appalling features of a Microsoft OS. All the little geniuses can't get enough virtualization and abstraction. Virtual memory, the disk cache, and an OS that pages constantly are the bane of real-time applications. When the frame rate in your Windows games shudders inexplicably, it's usually because of random virtual memory management going on in the OS that your game can't control, or because drivers are locking out the CPU unnecessarily for too much time. The second cause is most commonly a feature of a network driver. DirectMemory was designed to allow real-time, RAM-hogging applications to co-exist with slow, latency-tolerant applications. DirectMemory died with company reorganization. It's my understanding that Memphis may even have taken a backward step in this area by removing the ability to VirtualLock more than a few K of memory.

See evil in a whole new light. Gradient lighting means enemies move in and out of the darkness as smoothly and realistically as predators of this or any other world. Bi-linear texturing means they stay sharp, up close and personal. 24-bit color means the red of their blood runs colder. And seamless junctures between network games on a universe of servers means this is immersion you never have to leave. Unreal. Alter your reality...forever.

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LOOK FOR THE NOVEL FROM POCKET BOOKS

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Composite Video 1
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The Internet
Restart Without TV
The Microsoft Network
WaveCenter Lite Setup
Start
Composite Vid...

MUST SEE PC

*Your **television** and **computer** are slowly morphing into a single **beast**. But is the new **species** a dog or a race **horse**? Two reviews of mongo **entertainment systems** tell the story of **TV/PC** convergence.*

In the year since *boot* first explored the emerging convergence between TVs and computers, technological Darwinism has exacted its toll. Some companies have changed hands (and huge wads of cash) to jump-start sales, while others have watched their products suffocate under the weight of consumer indifference.

Take WebTV, the dumb and dumber version of a low-cost PC. Promoted as a net surfing device—but capable of much less—WebTV failed to catch on, and seemed destined for the trash heap. And it would have died, too, if Microsoft hadn't shelled out $425 million to buy the company. But Microsoft's infusion of capital hasn't helped. Industry experts surmise only about 50,000 of these terminals have been sold to date, and the number doesn't seem to be growing.

Industry analyst Jupiter Communications estimates that of the 36 million households online by the year 2000, more than 16% will jump on the Internet from a non-PC device. But with WebTV floundering, what device will attract those 5.7 million people? It certainly won't be the Pippin. The Bandai- and Apple-developed product has already died a quick and deserved death. And with the Sega Saturn on its last legs, Sega's NetLink product will be making a hasty departure, too. Another contender, JCC's iBox, is also D.O.A., and if Matsushita's much vaunted M2 hardware couldn't cut it as a console system, it's doubtful it will succeed as a set-top box.

Micron will attempt to break the chain of failures with a $1,000 convergence product slated for release in early 1998. The "Fusion Theatre" will be the size of a VCR, and incorporate front composite video inputs, Firewire, USB, DVD-ROM, and 3D acceleration. But for now, it's up to other PC manufacturers to pick up the slack, and sell family room solutions that are anything but tiny AV peripherals.

Gateway 2000 has introduced new models of its big-screen Destination product, including a Pentium II 300MHz behemoth. And earlier this year, Compaq introduced its own TV/PC product, PC Theatre, combining a 200MHz CPU with a massive 36-inch custom RCA monitor.

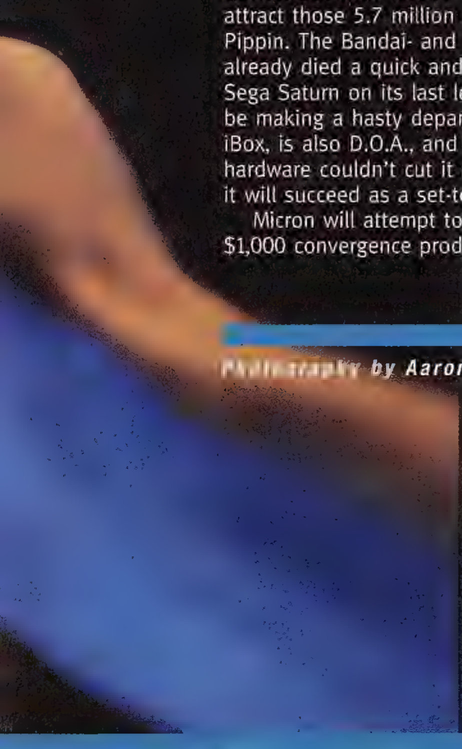
While Gateway 2000 is a seasoned veteran, Compaq admits the PC Theatre is part of a retail test phase, continuing throughout 1997. "It's a very undefined product category, and we're trying to tap into the sensitivity of the market," says Compaq's Patrick Griffin. "Retailers aren't sure if they should put the products in their PC or TV departments, and you've got to train the store staff so that the TV guy can sell the PC, and vice-versa."

Griffin says the recent $1,000 price drop on the PC Theatre wasn't due to poor sales, but was a "deliberate measure to judge where the market is, and how big it's getting."

Market-schmarket. Product positioning is for people who don't like computers. What about performance? What about display quality? What about booming bass and crispy trebles? On the next four pages, we dissect the two big players in the emerging big-screen PC war, and tell you whether it's time to buy a behemoth for the den.

—Bryan Del Rizzo

Photography by Aaron Lauer



Compaq PC Theatre

Looks Great, Less Filling

The PC Theatre tries really hard to be the consummate living room PC, and with a glance at its massive 37-inch monitor, you may be quick to assume it is. After all, who wouldn't be awed by the spectacle of playing *Dungeon Keeper* on a screen three feet high? Unfortunately, once you get a chance to peek inside the case, and take the components for a test drive, your fascination will wane.

When compared to the Destination, the PC Theatre's shortcomings stick out like a sore thumb. Instead of noticing components that are included, you notice parts that have been forgotten.

Such as the DVD-ROM drive.

There isn't one.

The PC Theatre is supposed to facilitate your entire home entertainment experience, and yet a DVD-ROM drive isn't included. Compaq promises future generations will have one, but the current omission is glaringly obvious, and sorely missed.

Speaker quality is lacking, too.

Although the two 5W monitor-mounted speakers do a good job of pumping audio, they can't compete against a true surround-sound, multi-speaker setup—the bare-bone minimum for even a beginning audiophile.

Quake fraggers will undoubtedly need a good dose of Dramamine to handle the intense big-screen action, but you'll have to settle for unaccelerated mayhem—no 3D card is included. And after being forced to endure the dismal onboard ESS1888 FM-synth, you may want to keep a bottle of Pepto Bismol around to settle your stomach.

If that isn't bad enough, the PC Theatre uses infrared for controlling the wireless keyboard and remote. This can be problematic when someone or something blocks the signal.

And don't get us started on the funky proprietary motherboard design.

Now as bad as all of this may sound, the PC Theatre still has a lot going for it. The 36-inch RCA monitor looks and performs great—and thankfully doesn't exhibit any annoying glare. During testing, the 200MHz MMX-equipped CPU performed well, and was on par with other 200MHz machines *boot* has reviewed. The customized Tseng Labs video card had no problems with our AVI benchmark, but shearing and ghosting were apparent during full-screen MPEG playback. The 3.6MB/sec hard drive transfer rate was excellent, as was the CD-ROM and DOS gaming performance (VESA 2.0 support is even included). Having stated all that, let's move on to the stuff that's great—namely the keyboard, remote control, on-screen control and programming interface.

The keyboard is a treat, and the trackball is a breeze to use. The remote control is loaded with buttons and features, and since it's programmable, you can use it to control your other AV components. The on-screen controls are the best we've seen, and the Theatre's TV-integration is absolutely killer.

One other bonus: The PC Theatre looks like it belongs in your living room. The aesthetics of the case, combined with the attractive and sturdy TV stand, help make it a worthy addition to your entertainment center (though the stand will cost you an extra $299).

Overall, the PC Theatre falls short in a few areas, but with its recent $1,000 price drop, it's still a solid attempt to realize the convergence market.

—Bryan Del Rizzo

under the hood

THE BRAINS	
CPU	Intel Mobile Pentium 200MHz MMX
L2 Cache	256K pipelined burst
RAM	40MB EDO DRAM (128MB maximum)
Video	Custom Compaq-engineered LPX form-factor
THE BRAWN	
Video	Custom Tseng Labs w/ ET6000 chipset and 2MB MDRAM
Hard Drive	3.8GB various manufacturers
CD-ROM	16X various manufacturers
Expansion Bus	One ISA, one PCI, one shared
Fax/Modem	33.6Kbps fax/modem
I/O Ports	One parallel, one serial, two PS/2, two USB, gameport
THE BEAUTY	
Display	36-inch RCA; .78mm dot pitch; max res. 640x480@60Hz
Sound	ESS 1888 FM-synth
Video	1024x768, 24-bit color
Speakers	5W stereo speakers (built into monitor)
Other	IR keyboard, remote control, Thrustmaster Phazer GamePad

EXPANSION MAP

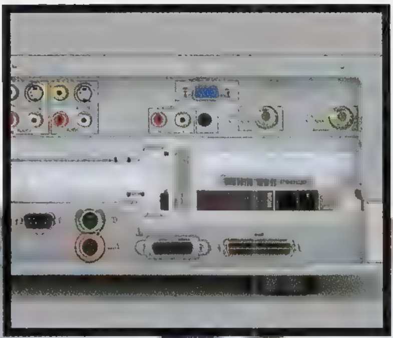
ISA	Modem
ISA	Free
Riser Board	Free

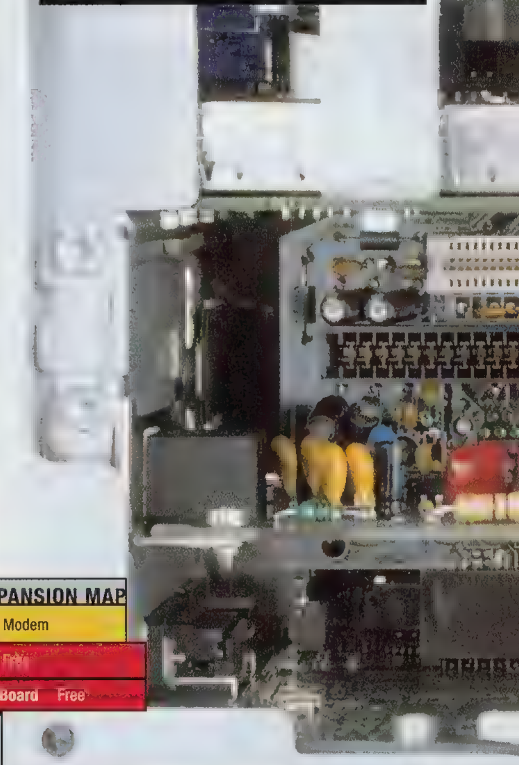
THE BUNDLE You Don't Know Jack I Math Adventure I Blockbuster Movie Guide I Virgil Reality I Compton's Encyclopedia 1997 MPEG I Pro Football 97 I Hunter Hunted I Indy CarII I Online Services

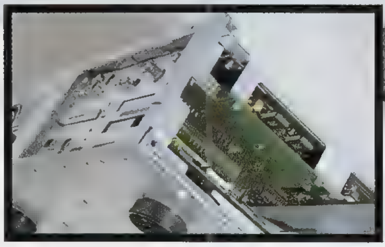
boot	*down*
1:40	:04

PLUG IT IN

The rear of the CPU includes enough inputs and outputs for most home systems. It's also color-coded for remarkably easy set-up.

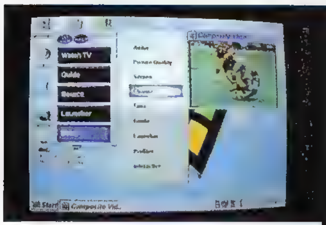






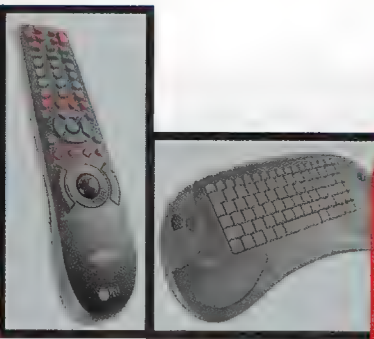
MOTHERBOARD MAYHEM

Compaq says the motherboard is custom-designed by its engineers—and we believe 'em. No other company in its right mind would volunteer to use this funky, H-shaped, riser board design. Oh well, at least there's one free slot. Good thing, too. You'll need it for 3D acceleration.



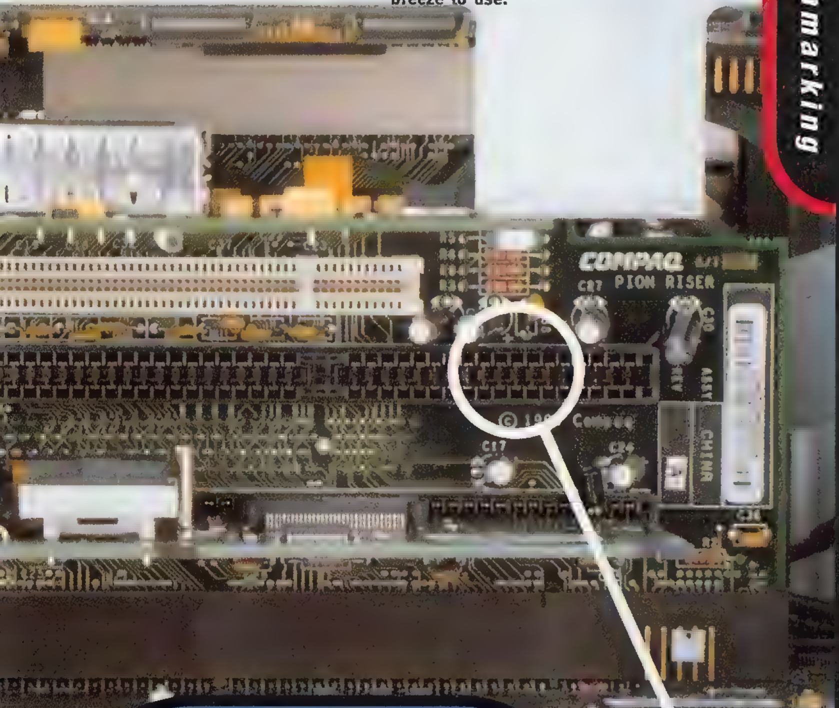
WE ALL SCREAM FOR ON-SCREEN

Superlatives can't convey how terrific the on-screen controls are. Menus are logically organized, and you can make adjustments to just about everything, including color warmth (for TV viewing), closed captioning, audio levels, signal feeds, and more.



TOTE THE REMOTE

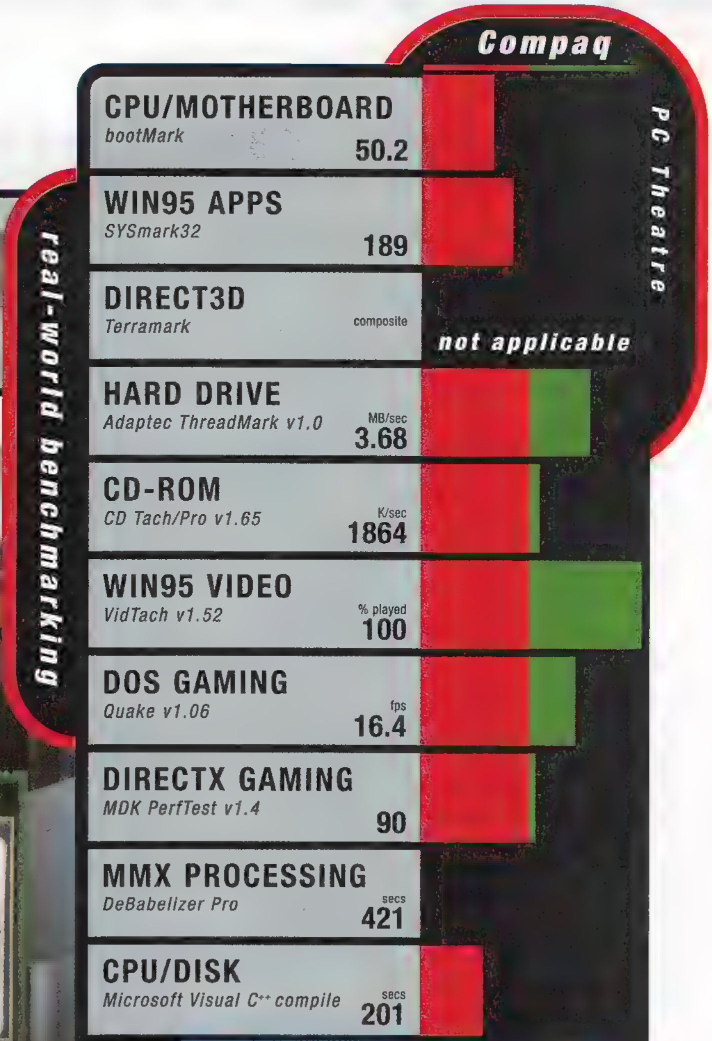
Check it out: The remote is programmable, and can be used to control the PC, TV, VCR and other AV peripherals. The keyboard is a treat, and the track-ball is a breeze to use.



RISING SUN

All the audio/video components are positioned on a unique riser board. Notice the absence of any fans. All the cooling comes compliments of the multiple heat sinks. Even the transistors have 'em.

The PC Theatre scores bonus points for surface aesthetics but doesn't have the guts of a winner.



Test	Benchmark	Unit	Score
CPU/MOTHERBOARD	bootMark		50.2
WIN95 APPS	SYSmark32		189
DIRECT3D	Terramark		composite
HARD DRIVE	Adaptec ThreadMark v1.0	MB/sec	3.68
CD-ROM	CD Tach/Pro v1.65	K/sec	1864
WIN95 VIDEO	VidTach v1.52	% played	100
DOS GAMING	Quake v1.06	fps	16.4
DIRECTX GAMING	MDK PerfTest v1.4		90
MMX PROCESSING	DeBabelizer Pro	secs	421
CPU/DISK	Microsoft Visual C++ compile	secs	201

The 36-inch behemoth monitor notwithsatnding, the PC Theatre needs a CPU revamp. PC/TV-integration is top-notch, however.

+	−
200MHz MMX	Funky motherboard
36-inch monitor	No DVD-ROM drive
USB ports on front	No 3D card
On-screen controls	Max 640x480 resolution
Integrated TV-tuner	FM-sound only
Picture-in-picture	Spotty IR control
Universal remote control	Limited expandability
Livingroom aesthetics	No surround speakers
TV stand	

***Price** $3,999,*
$299 for TV stand
***Company** Compaq*
***Phone** 800.345.1518*
***URL** www.compaq.com*

boot verdict
6

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

Gateway **Destination** D6-266

The Leader Of The Pack

boot KICK ASS! PRODUCT

The very first Destination system—a lowly 166MHz—was reviewed way back in *boot* 04. Not much has changed in the last seven months. The 31-inch monitor and Harmon/Kardon surround-sound system remain the same, and the keyboard and remote control are RFing as usual. But the CPU has undergone a major facelift, and the subsequent results are stunning.

The D6-266's processor has been upgraded to a Pentium II-266MHz. Factor in 64MB of EDO DRAM, and you've got a system that effortlessly and unmercifully explodes through our benchmarks. Hard drive transfer rates? Off the scale. *Quake* frame rates? Off the scale. MMX Processing? Off the scale. Except for the DVD-ROM transfer speed (operating more like an 8X CD-ROM drive) and mediocre PowerVR Direct3D drivers, the D6-266 chewed up and spit back everything we fed it.

The first-generation Toshiba DVD-ROM drive was another bonus, and, combined with the monitor and sound system, provided a genuine home-theater experience. Images were crisp and bright, with the on-screen controls offering numerous adjustments for picture quality, audio, and viewing modes (including widescreen, letterbox, and pan/scan). The on-screen menu is extensive, easily besting traditional remotes.

The D6-266 is the first convergence product to include 3D acceleration, and although the Apocalypse 3DX (utilizing the PowerVR architecture) is a good choice, the Direct3D implementation was less than impressive. Considering most Voodoo and Voodoo-Rush equipped cards score upward of 900 in the Terramark test, the sub-400 score for the Apocalypse 3DX dampened our enthusiasm. The low score reveals NEC's mediocre Direct3D drivers, but even upgrading to DirectX 5.0 (which is supposed to improve performance) didn't help much. The score only jumped a measly 38 points to 375. Three PowerVR titles come with the D6-266—*Ultim@te Race*, *Virtua On*, and *Actua Soccer*—but only *Ultim@te Race* is worthy of any attention. Considering the dearth of PowerSGL titles out there, a Voodoo solution would've been preferred.

STB's Videorage II+ (custom-built for Gateway) drives the 2D and TV performance, and includes one input each for coax (or antenna), S-Video, and composite video. If you're a hardcore videophile, you've also got the option of using the Harmon Kardon Pro-Logic receiver as a switch box to control more components.

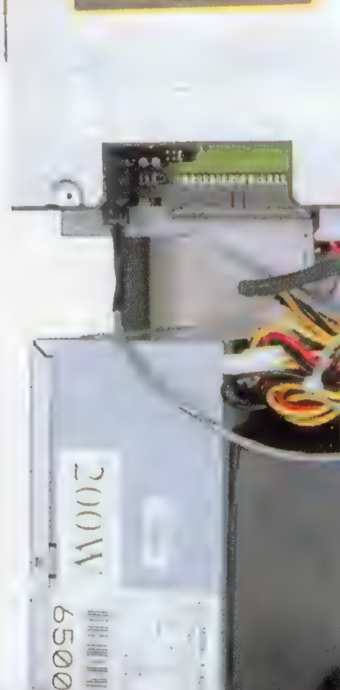
The Mag Innovision 31-inch monitor (.83 dot pitch) sets the tone for big-screen gaming, but you'd better be sitting at least six feet away for optimal viewing. Previous versions of the monitor were Class B certified at 640x480; newer models are sanctioned for sale at 800x600. Sadly, on-screen controls aren't available. All monitor adjustments (not including DVD playback) must be made via the front panel buttons.

There isn't much room inside the case for future expansion, (it's already chock full of valuable nutrients and components), but once you've got this baby set up in your living room, chances are you'll be too busy crowing to all of your friends to find time to open the case.

—*Bryan Del Rizzo*

DIVINE SOUND

The Harmon/Kardon sound system is awesome. Included are a Dolby Pro-Logic receiver; 30W left, right, and center speakers; two 20W rear speakers; and a 50W woofer for pulse-pounding good measure. Gateway also includes enough heavy-duty speaker wire to wire a good-sized room. The receiver offers inputs and outputs for a tape deck, CD, TV and two VCRs, but not S-Video.



under the hood

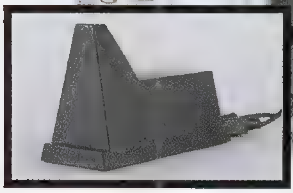
THE BRAINS	
CPU	Intel Pentium II 266MHz (single)
L2 Cache	512K pipeline burst
RAM	64MB EDO DRAM (128MB maximum)
Motherboard	Intel Portland 440FX
THE BRAWN	
Video	STB Videorange II+ w/ Brooktree 2164 chipset and 2MB VRAM; Videologic Apocalypse 3DX (with 4MB SDRAM)
Hard Drive	6.4GB Quantum Fireball
DVD-ROM	1x Toshiba SD-M1002
Expansion Bus	Two ISA, three PCI, one shared
Fax/Modem	56.6Kbps X2
I/O Ports	Two USB, two serial, one parallel
THE BEAUTY	
Display	Mag Innovision 31-inch Mitsubishi monitor; .83 dot pitch
Sound	Ensoniq VIVO 90 (iMB ROM wavetable)
Speakers	Harmon Kardon AVR10 Dolby Pro-logic receiver with five satellites and powered sub-woofer
Other	RF keyboard, remote control, Storm's Easy Photo Drive

EXPANSION MAP

PCI	MPEG2 decoder
PCI	PowerVR
PCI	Video/TV Tuner
PCI	Free/shared
ISA	Easy Photo/shared
ISA	Modem
ISA	Sound

THE BUNDLE Microsoft Works | The Neverhood | MS Encarta 97 World Atlas | MS Automap Trip Planner | Sesame Street Elmo's Preschool | Lotus Organizer 97 | Barbie Storymaker | Earthworm Jim | Road Rash | DVD Sampler | *PowerVR-enhanced titles:* Ultim@te Race | Virtua On | Actua Soccer

boot :54 *down* :08



BOOT RADIO 98.1 ON THE RF DIAL

The keyboard and remote are both RF devices, meaning you don't have to worry about line-of-sight interference from stray cats, dogs, spouses, or children.

REMOTE OPERATION

The one negative: The remote isn't programmable or universal. The trackball is responsive enough, but since most remotes are made for one-handed operation, dragging and dropping can be a bear.

TRACKING DEVICE NOT RESPONDING

The RF keyboard also includes a track-pad, but the response is less than stellar (a wireless mouse would've been preferred). The keyboard also includes button to adjust the audio volume, change the TV channel, and to wake-up the trackpad, or TV.

"Décomposition moléculaire"

VOUS-PARLEZ EN FRANÇAIS?

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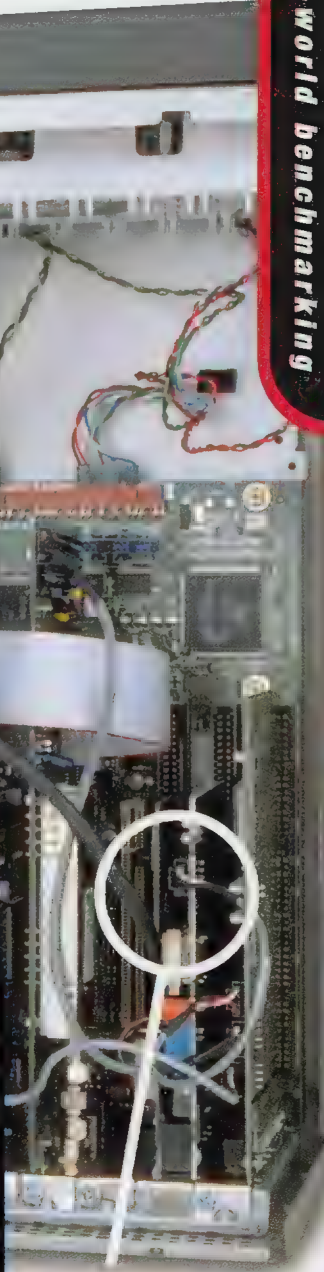


Sadly, on-screen controls aren't available—all monitor adjustments (not including DVD play back) must be made via the front panel buttons.

IN THE CASE

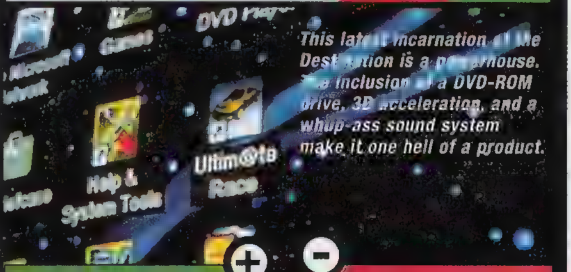
Other components include a good-sounding Ensoniq Vivo 90 wavetable sound card, easy Photo Drive for scanning photos for Grandma, a 6.4GB Quantum fireball hard drive, and a 56.6Kbps X2 modem. USB ports are included, but are located in the back. Drat!

Gateway

Destination D6-266

real-world benchmarking

CPU/MOTHERBOARD	*bootMark*		127.1	
WIN95 APPS	*SYSmark32*		287	
DIRECT3D	*Terramark*	composite	337	
HARD DRIVE	*Adaptec ThreadMark v1.0*	MB/sec	5.46	+
CD-ROM	*CD Tach/Pro v1.65*	K/sec	1202	
WIN95 VIDEO	*VidTach v1.52*	% played	100	
DOS GAMING	*Quake v1.06*	fps	20.4	+
DIRECTX GAMING	*MDK PerfTest v1.4*		111	
MMX PROCESSING	*DeBabelizer Pro*	secs	225	+
CPU/DISK	*Microsoft Visual C++ compile*	secs	112	



This latest incarnation of the Destination is a powerhouse. The inclusion of a DVD-ROM drive, 3D acceleration, and a whup-ass sound system make it one hell of a product.

⊕	⊖
PII-266MHz	Mediocre Direct3D drivers
DVD-ROM	Max 800x600 resolution
56.5Kbps X2 modem	Non-responsive track-pad
31-inch big-screen action	Same glassy monitor
Harman/Kardon surround-sound	Non-programmable remote
Integrated TV-tuner	No entertainment unit included
Awesome performance	USB ports on back

Price **$4,499**
Company **Gateway 2000**
Phone **800.326.0380**
URL **www.gateway2000.com**

boot verdict
9

A complete breakdown of benchmark results is available on the *bootNet.* Point your browser to www.bootnet.com

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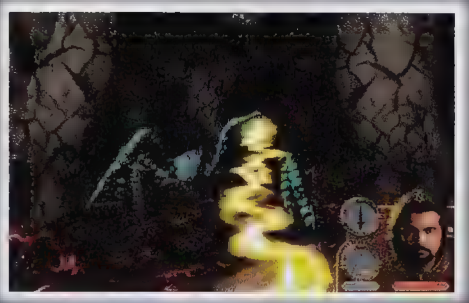

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YOUR PERSONAL TECH **BRIEFING** ON THE **CONCEPTS** AND **COMPONENTS** THAT MAKE UP THE **PC** EXPERIENCE

this month:

Conquering IRQsome Conflicts

In the modern world of Windows 95, a nagging problem remains: the IRQ conflict. Plug'n'Play is a good idea, but what happens when it doesn't work? Tech support can be expensive and time consuming, but it can often be avoided by rudimentary knowledge of IRQ channels and some simple techniques. Peripherals use only a handful of IRQs, but they can be the ones that are already in use. Resolving IRQ conflicts is a matter of getting one device moved to another available setting. That is, when another IRQ is available. System manufacturers add PCI slots to motherboards, but what good is it when there aren't enough IRQs to go around? Read on and become master of your IRQ domain.

Devices requiring the CPU's attention must request processor time via an Interrupt ReQuest (IRQ) setting. When a request occurs, the CPU suspends the current operation and gives control to the assigned IRQ's device driver. Think of it as a direct line of communication with the CPU. IRQ-hungry peripherals include sound cards, video cards, network cards and modems.

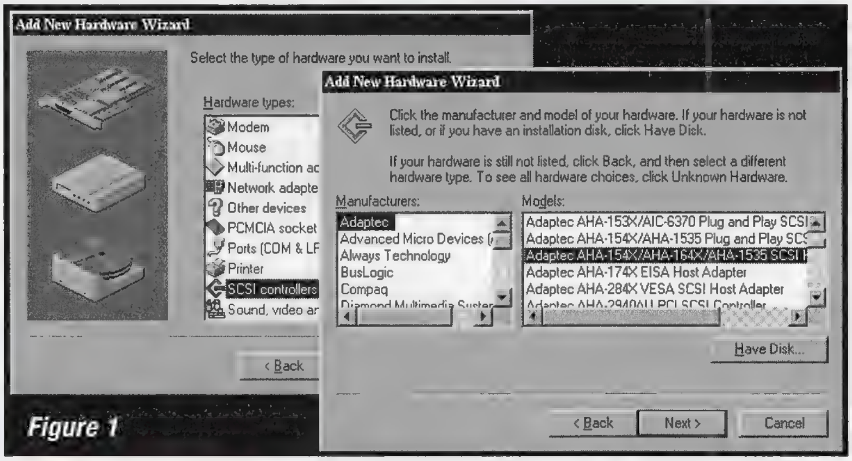
The original PC/XT only used one 8259A Controller chip, giving it eight IRQ inputs. With the 286, another chip was added, for a total 16 IRQs. The two chips are arranged in a master/slave configuration, with the slave 8259 chip cascading through the master controller at IRQs 2 and 9. All the IRQs are preassigned except for 10, 11, 12, and 15.

INTERRUPT CONTROLLER 1

IRQ 0	*Timer Output / System Timer*
IRQ 1	*Keyboard controller*
IRQ 2	*Route to Interrupt Controller 2, IRQ8*
IRQ 3	*COM2 OR COM4*
IRQ 4	*COM1 OR COM3*
IRQ 5	*LPT2, network card, sound card*
IRQ 6	*Floppy Disk Controller*
IRQ 7	*LPT1, network card, sound card*

INTERRUPT CONTROLLER 2 (AT ONLY)

IRQ 8	*Real Time Clock*
IRQ 9	*Software redirect to IRQ2*
IRQ 10	*Available*
IRQ 11	*Available*
IRQ 12	*Available / Standard PS/2 Port Mouse*
IRQ 13	*Math Coprocessor*
IRQ 14	*Primary IDE Hard Disk Controller*
IRQ 15	*Secondary IDE Hard Disk Controller / Available*


Add New Hardware Wizard

Select the type of hardware you want to install.

Hardware types:
- Modem
- Mouse
- Multi-function ac
- Network adapte
- Other devices
- PCMCIA socket
- Ports (COM & LF
- Printer
- SCSI controllers
- Sound, video ar

Add New Hardware Wizard

Click the manufacturer and model of your hardware. If your hardware is not listed, or if you have an installation disk, click Have Disk.

If your hardware is still not listed, click Back, and then select a different hardware type. To see all hardware choices, click Unknown Hardware.

Manufacturers:
- Adaptec
- Advanced Micro Devices (
- Always Technology
- BusLogic
- Compaq
- Diamond Multimedia Syster

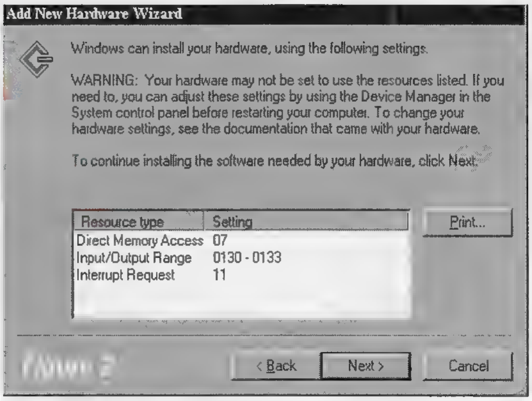
Models:
- Adaptec AHA-153X/AIC-6370 Plug and Play SCSI
- Adaptec AHA-154X/AHA-1535 Plug and Play SCS
- Adaptec AHA-154X/AHA-164X/AHA-1535 SCSI
- Adaptec AHA-174X EISA Host Adapter
- Adaptec AHA-284X VESA SCSI Host Adapter
- Adaptec AHA-2940AU PCI SCSI Controller

Figure 1

HOW TO AVOID CONFLICT

Adding devices, regardless of Plug'n'Play, is a nightmare. It always comes down to IRQs. When installing a new peripheral into your machine, use the "Add New Hardware" wizard located in the Control Panel. This is one of Win95's best features. Remember to click "No" when asked if you want Windows to do a search—after all, you haven't hooked up the peripheral yet.

Now choose the type of device you're installing, and you'll see a list sorted by manufacturers and models (Figure 1). If your model isn't available, click "Have Disc..." and follow the directions for installing new drivers. New drivers usually come bundled on floppy disk.


Add New Hardware Wizard

Windows can install your hardware, using the following settings.

WARNING: Your hardware may not be set to use the resources listed. If you need to, you can adjust these settings by using the Device Manager in the System control panel before restarting your computer. To change your hardware settings, see the documentation that came with your hardware.

To continue installing the software needed by your hardware, click Next.

Resource type	Setting
Direct Memory Access	07
Input/Output Range	0130 - 0133
Interrupt Request	11

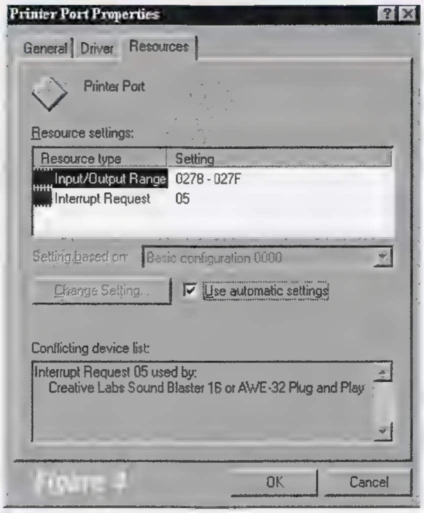
Figure 2

You will then be shown the available IRQ settings (Figure 2). If the peripheral is true Plug'n'Play, it'll let you know. Click the "Next" button, shut off your machine, and then add your peripheral with the assigned settings. Follow the instructions that came with your peripheral to change these settings.

RESOLVING CONFLICTS

When faced with an IRQ conflict, the first step is to track down the source. The best way to see which peripherals are assigned which IRQs is to look at the System Properties by opening the Control Panel, double-clicking the System icon, clicking the Device Manager tab and then double-clicking "Computer". This will give you a complete listing of your IRQsome devices. It's also a handy way to check settings such as DMA, input/output (I/O) ports and memory assignments.

As you can see in Figure 3, IRQs 10 and 11 are available. A red X denotes that the device is disabled, because it has either not been installed properly or just needs drivers. To re-enable the device, double-click it and remove the check from "Disable in this hardware profile" located under the "General" tab in its properties. You'll have to restart Windows to enable it unless it's a PCI device, which should start up dynamically after clicking the "OK" button. A yellow exclamation mark denotes a conflict. This can be an IRQ, DMA, I/O port or memory setting conflict. But more often than not, it's IRQ related.


Printer Port Properties

Resource settings:

Resource type	Setting
Input/Output Range	0278 - 027F
Interrupt Request	05

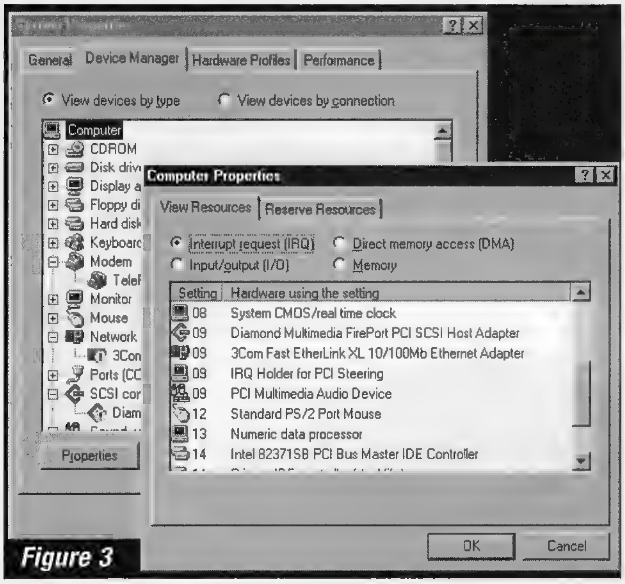
Setting based on: Basic configuration 0000

☑ Use automatic settings

Conflicting device list:

Interrupt Request 05 used by:
Creative Labs Sound Blaster 16 or AWE-32 Plug and Play

Figure 4



● View devices by type ○ View devices by connection

Computer Properties

● Interrupt request (IRQ) ○ Direct memory access (DMA)
○ Input/output (I/O) ○ Memory

Setting	Hardware using the setting
08	System CMOS/real time clock
09	Diamond Multimedia FirePort PCI SCSI Host Adapter
09	3Com Fast EtherLink XL 10/100Mb Ethernet Adapter
09	IRQ Holder for PCI Steering
09	PCI Multimedia Audio Device
12	Standard PS/2 Port Mouse
13	Numeric data processor
14	Intel 82371SB PCI Bus Master IDE Controller

Figure 3

Another way of finding IRQ conflicts is by looking for the small blue "i" alongside a device in the Computer Properties. In the example in Figure 3, one is next to the 3Com Adapter.

The next step is the hard part: changing conflicting devices' assigned IRQs to free channels. Look to your peripheral's documentation for help before messing with settings. Some devices, such as ISA network cards, have DOS-based config utilities for changing IRQ setting. Other peripherals, such as sound cards, assign settings during bootup via the AUTOEXEC.BAT file.

Clicking the Resources tab of the devices' properties sometimes allows you to change IRQ assignment from directly within Windows, depending on the peripheral (Figure 4). If your device supports this, you've found the easy way out. Simply remove the checkmark next to "Use automatic settings" and then double-click the Interrupt Request line within the Resource Settings window. This'll bring up another dialog box allowing you to change the IRQ setting. System devices, such as the Printer Port and Communications Ports, will only allow you to change settings based on set configurations. To do this, remove the checkmark as described before and change the Basic Configuration number by clicking on the drop-down menu and choosing another number. The Conflicting Device list will notify you once you're clear of conflicts.

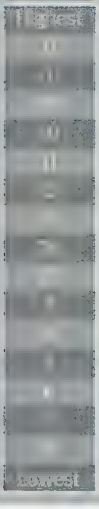
Unfortunately, with PCI cards—especially Plug'n'Play cards—the system forces IRQ assignments on you. You can't change settings from within Windows. The only way to fix these cards is through the system BIOS. Enter BIOS set-up while booting by pressing either F1 or the Delete key. A setting under Plug'n'Play devices or within the Advanced Settings menu will usually allow you to assign IRQ settings to PCI devices.

Resolving interrupt conflicts can be a daunting task, and it would be nice but quite impossible to list every type of device, the resources it uses, and how to change them. Believe it or not, the most important part to resolving a resource conflict is first to understand it. Only when we understand our enemies are we truly prepared to defeat them.

–Sean Cleveland

IRQ Priorities

If two simultaneous interrupts come in on two different lines, the one linked to an IRQ on the slave interrupt controller between IRQs 9-15 will have a higher priority than one linked to an IRQ on the master. Devices that are generally tied to the master interrupt controller are modems, sound cards and printers. The interrupt handler, which is code within the operating system itself, prioritizes interrupts and saves them in a queue if more than one is waiting to be handled. The scheduler then figures out which devices are going to get control next.



Freeing Up IRQs

The following are some suggestions for how to free up precious IRQ ports. Remember, disabling your Parallel port, COM ports and Primary and Secondary IDE controllers has to be done through the system BIOS, as well as Windows 95.

NOTE: PCI devices can share PCI IRQs, but Win95 does not support sharing PCI IRQs with other non-PCI devices, such as an IDE controller. Win95 display drivers don't use an IRQ, however PCI adapters request an IRQ for full backward compatibility. It's also not unusual to find a sound card using IRQ 7, the same IRQ used for LPT 1. The idea is that the printer is not always in use and can share its IRQ with another device that's unlikely to be in use at the same time as the printer.

- *Disable the Parallel port to free up IRQ 7.*
- *If you own a Sound card that takes up more than one IRQ, such as Creative Labs' AWE 32, swap it out for one that does not. The IDE Controller on the AWE 32 takes up an IRQ that cannot be disabled.*
- *If you're not using both internal IDE ports in your machine, disable the Secondary IDE Controller, thus freeing up IRQ 15.*
- *If all your drives are SCSI, disable both the Primary and Secondary IDE Controllers, to free up two IRQ ports (14 & 15).*
- *Disabling COM 1 will free up IRQ 4, and COM 2 will free up IRQ 3.*
- *If you are using a serial mouse and your machine has a PS/2 mouse port, then disabling the PS/2 port will free up IRQ 12. Heck, if you're using a PS/2 mouse, ditch it for a serial mouse to free up IRQ 12.*

DROWNED GOD
CONSPIRACY OF THE AGES
LISTEN TO YOUR EARS
BAZOOKA

To create the perfect sound for Horus, the Drowned God™ sound designers blew through an eight-inch plastic straw into the studio toilet and recorded it with a condom-wrapped microphone.

Of course, if you had a Bazooka, you already heard that.

Bazooka® MS5 multimedia subwoofer lets you hear things in the CD-ROM *Drowned God*™ you never heard before — [illegible] lows you simply can't hear with ordinary computer speakers. Call [illegible]The-Tube for your nearest dealer, [illegible] enclosure makes. Then get ready for a subwoofer so amazing, you'll swear it was reverse [illegible]. In Canada, call: Trends [illegible]

[illegible], and Listen to Your Ears are [illegible] courtesy of IMG and Inscape [illegible] and Inscape. All [illegible]

Product Information Number 304

Overclocking—Not!

I read your article about overclocking, and just got the nerve to try it. I'm running a P100 with 32MB of RAM, and an Intergraph Intense 3D card. According to the motherboard manual, it was running at 66mhz with a 1.5 multiplier. I followed your directions, and used the information in my manual to switch the jumpers, and was able to get the computer to start at 120MHz. When it got past the start-up procedure, and began to load Win95, I would get an error. Sometimes it would say that the computer must be restarted. Other times it would say that there was an error with a VXD, but it would never finish loading Windows. Any ideas? I tried all the different jumper settings but nothing else worked. I then decided to switch it to 50mhz with a 2 multiplier, and it actually seems to run faster than before. Can this be? Would a computer run faster at 50MHz with the 2 multiplier or 66MHz with a 1.5?

Damon Saylor

> "The **algorithm** used in **Win95** to detect the CPU was completed **before** Cyrix's **6x86** was released, and therefore the Cyrix 6x86 responds to the algorithm just as a **486** does."

Disc editor Sean Cleveland replies: *Regarding your first question: Your project didn't work. Even though it booted up and displayed the correct speed, it failed to run properly. This isn't the end, however. It may just be that your CPU isn't cool enough to run at this speed. Your second question has stumped me—it doesn't make sense why it would be faster. The system bus is running slower. Maybe you have some other older peripherals that aren't functioning correctly at 66MHz, and the speed drop helped (although I doubt it). You may want to haul out your BIOS manual and check those settings. If any* boot *reader has any ideas on the perceived speed boost, please let us know.*

PIO à la Mode

I have an aging hand-built P133 with 32MB RAM, a 1.2GB Quantum Bigfoot 1280 hard drive supporting PIO mode 5, and a Sony CDU311 8X CD-ROM. My motherboard offers an option to bus master any (unfortunately that means all) IDE devices on board. I opted to do this in order to minimize CPU utilization by my CD-ROM. Unfortunately, now the hard disk is only transferring 0.8MB/sec, instead of the 3.5MB/sec that it gets usually. Is there some kind of performance trade off that I don't know about, or does it have to do with the PIO mode that I'm choosing? If there's some kind of conflict there, then is the trade-off worth it?

Chris Brockman

Disc editor Sean Cleveland replies: *You were right about the PIO mode. Most hard drives act erratically and display performance degradation when this setting is set wrong. Use the Auto setting if you have one. Otherwise, start dropping the setting by one and recheck the transfer rate. A good test is Adaptec's* Threadmark, *which is on the bootDisc every month. If you still have problems, check with Quantum.*

Mistaken Identity

(1) I purchased an Intel 430VX motherboard and Cyrix 6x86 CPU PR150 running at 120MHz. When I boot my computer, my CMOS identifies my CPU correctly. However, Win95 identifies it as a 486 CPU. This has caused problems when I try to play games that are for Pentiums only. Can I change how Win95 identifies my CPU? (2) The Intel 430VX motherboard doesn't show the name of the manufacturer. The user's manual doesn't give the manufacturer's name either. The manual says it supports Pentium 75MHz to 200MHz, Cyrix 6x86, AMD K5, and P55C CPUs. Is there another way to find out the motherboards manufacturer? (3) Does the P55C mean that the motherboard supports the Pentium MMX? And if it does, then I have a problem because the manual shows two possible jumper settings, and they are 3.3V and 3.5V only. Is it correct that the MMX CPU is only 2.5V. Could I still be MMX ready?

anon

Hardware editor Andrew Sanchez replies: *In regard to CPU identification, the answer is no. The algorithm used in Win95 to detect the CPU was completed before Cyrix's 6x86 was released, and therefore the Cyrix 6x86 responds to the algorithm just as a 486 does. To verify that your system is using the 6x86 microprocessor, Cyrix recommends you reference your computer's BIOS startup screen. If you really need to know that your Cyrix processor is more than just a 486, the following software utilities identify the 6x86 CPU correctly:* Diagsoft QA Factory 6.02 *and* QA Plus/FE 5.42; Quarterdeck Manifest 4.01; *and* PC Doctor Rev 1.5.162 *from Watergate Software.*

As far as games not playing, many applications will try to do Pentium routines if they detect a Pentium Processor. The 6x86 is a Cyrix-designed processor that has unique features that need to be enabled and used properly. Cyrix does not support all Pentium routines, so unless the games in question have a patch that addresses this problem, then you're out of luck. Take a walk down to **www.cyrix.com/process/support/games.htm** *for more information.*

As far as your identity crisis, sometimes motherboards give their make and model number when booting up for the first time. Look for any nomenclature references, such as Tyan S1682 Rev1.2A, for example, when your system starts up. It'll usually appear after the BIOS messages is displayed. Apart from closely inspecting your motherboard for signs of manufacturer name or model number, you're pretty much out of luck.

P55C is Intel's Pentium with MMX technology. You're correct in that MMX processors operate at a lower voltage, but that lower number is for the processor core voltage. The I/O pins will still require around 3.3V. The main thing you need to ensure is that your motherboard supports dual voltage CPUs. If it lists jumper settings for P55C processors, then more than likely your board does support Socket 7 MMX CPUs.

VESA 2.0 Hoodwink

I recently got a new P-II/266 from Xi. It includes an STB velocity 3D with 4MB VRAM, and 4MB DRAM (S3 86c988). But it doesn't support VESA 2.0. I'm trying to get VESA 2.0 support using SciTech's *DisplayDoctor*, but when I restart my computer after installation, Windows warns me that I need to get a proper driver for my video card, and puts me in 16 colors, 640x480. But, I do get my VESA 2.0, which enhances *Quake* dramatically. How can I fix this problem? Do I have to forget about VESA 2.0. I don't want to run *Quake* and *Duke* with pathetic resolutions on such a machine.

Itay Rand

Technical editor Chris Dunphy replies: *When you follow the default procedures for installing* DisplayDoctor, *it will stomp all over your Windows graphics drivers even if all you wanted was a speed boost in DOS games. But all you really need is the UniVBE component of the full* DisplayDoctor *pack. You don't even need to put it in your autoexec.bat. Just boot up in DOS and run UniVBE before starting up* Quake.

Keep a Safe Distance

How close to my tower can I safely place an unshielded speaker? I recently requisitioned a headphone-to-analog speaker wire jack from a friend. I placed two old 55-watt Realistic speakers underneath my monitor, and about a foot from my tower. I played a bit with the monitor and the speakers, and found that the field from the speaker magnets begins to effect the monitor in the usual way when the speakers are five or six inches from the screen (that is, with the axis of the magnet facing the monitor; otherwise the effect occurs from about two inches away). Should I keep rocking away to Reznor with the speakers so close, or should they be placed further from my tower?

Karl Pauls

Editor-in-Chief Brad Dosland responds: *It sounds like you've figured out our personal rule of thumb. Without knowing just how shielded any given component might be, we like to keep those magnets at a monitor-distorting distance from any magnetic media we cherish. We advise that you do the same.*

Stuck in the PC mire? Send all your technical questions to clinic@bootnet.com.

CAVEDOG ENTERTAINMENT™
PRESENTS...

TOTAL ANNIHILATION™

The New Landscape Of War

In a distant part of the Galaxy, the Core and the Arm continue a thousand year battle over long forgotten ideals, destroying everything in their path...

TOTAL ANNIHILATION is a real-time war game featuring true 3D terrain and run-time generated 3D units. Tanks drive up and over hills, tilting and rocking with each bump in the landscape and impact with enemy weapons. Battle on diverse landscapes, including lava worlds, ice planets, desert valleys, alien tundra, towering mountain peaks and vast island-dotted oceans. Build defenses high in the hills for a better view and a better shot. Giant Bertha cannons pound the enemy from across the world. Planes bank and dive in intense air-to-air combat. Amphibious tanks drive into and dive under water for surprise attacks. Download new reinforcements from the web and swarm the enemy with hundreds of ever evolving units.

TOTAL ANNIHILATION'S 3D landscape is a revolution that demands deeper strategy and generates more realistic game play. Mobilize your forces and experience the new landscape of war!

Cavedog™
Entertainment

www.cavedog.com

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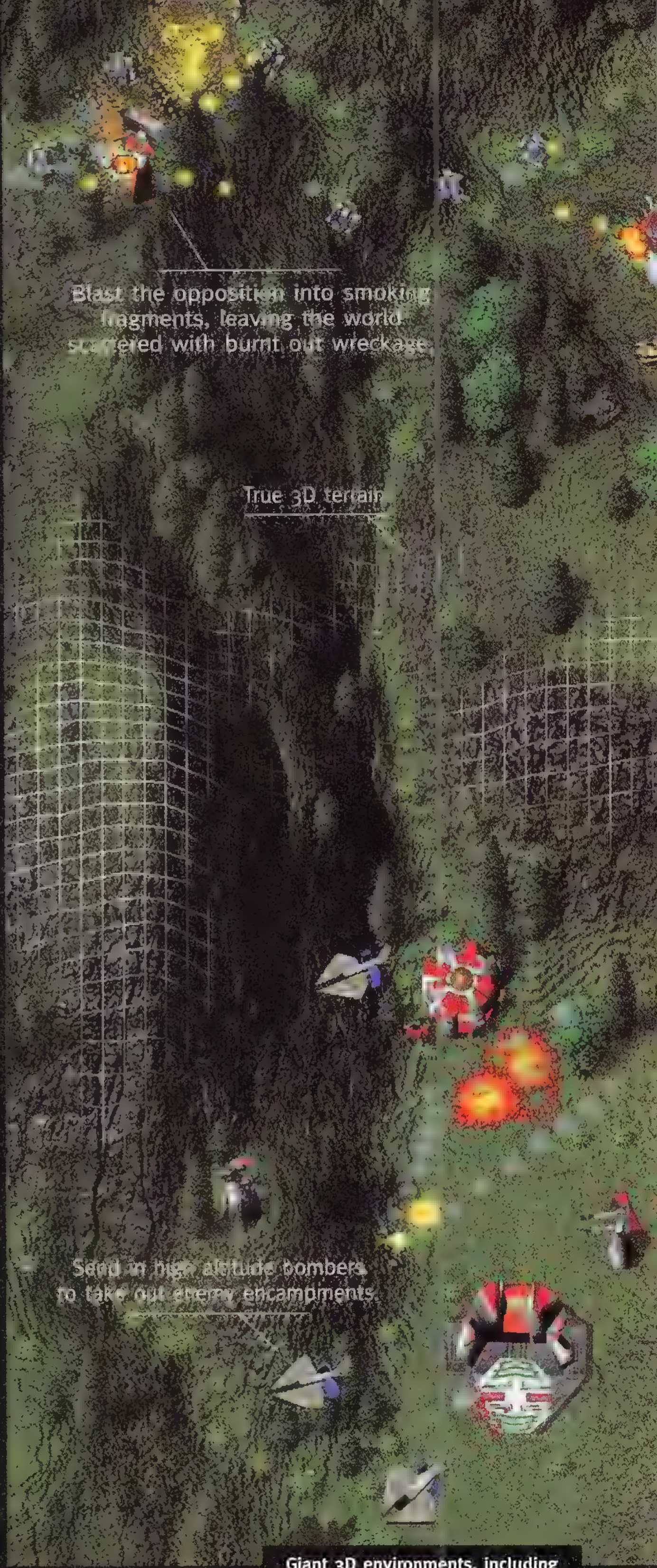
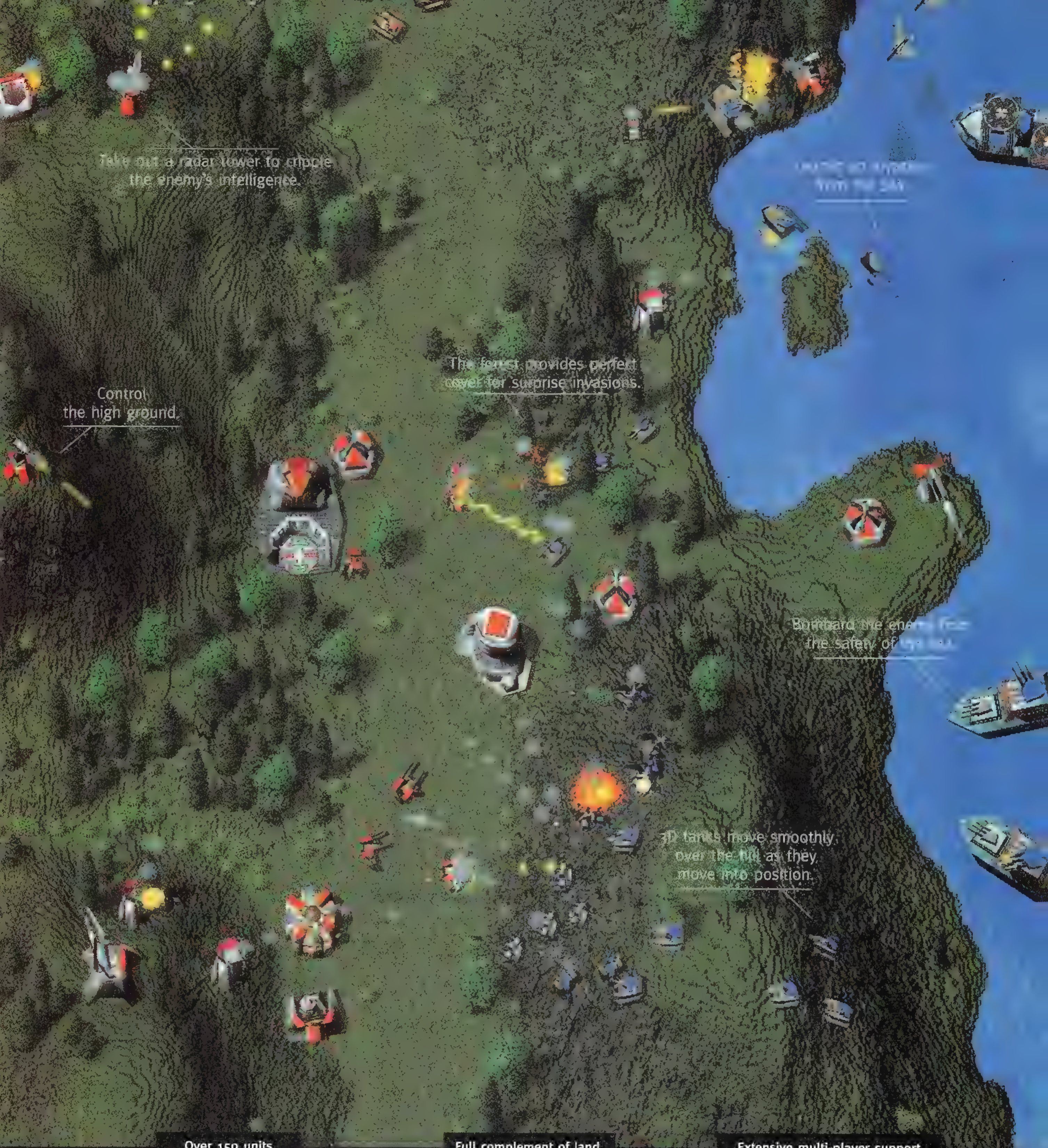
RATING PENDING RP CONTENT RATED BY ESRB

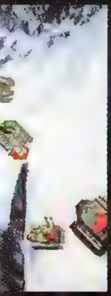
a GT Interactive company

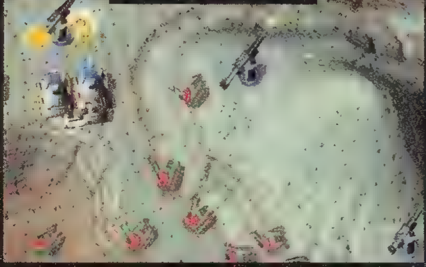
Designed for Microsoft Windows 95


Blast the opposition into smoking fragments, leaving the world scattered with burnt out wreckage.
True 3D terrain
Send in high altitude bombers to take out enemy encampments.

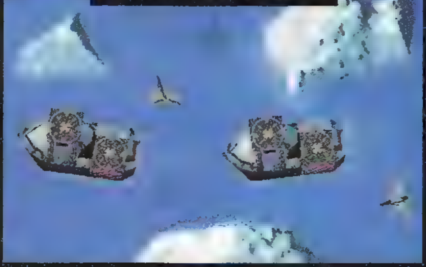
Giant 3D environments, including extra large maps for 32 meg users.


Take out a radar tower to cripple the enemy's intelligence.
Launch an invasion from the sea.
The forest provides perfect cover for surprise invasions.
Control the high ground.
Bombard the enemy from the safety of the sea.
3D tanks move smoothly over the hill as they move into position.

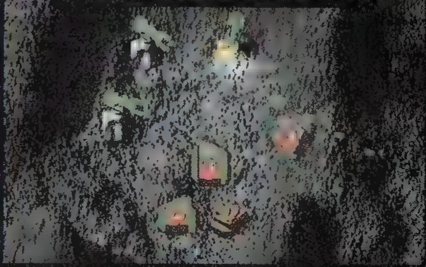




Over 150 units and 50 missions.



Full complement of land, air and sea units.



Extensive multi-player support including 'Watch and Join modes'.

STORAGE

EACH MONTH, **BOOT** EDITORS GATHER THE **BEST** PRODUCTS IN A SPECIFIC **CATEGORY** AND DEEM THEM: **BOOTWORTHY**

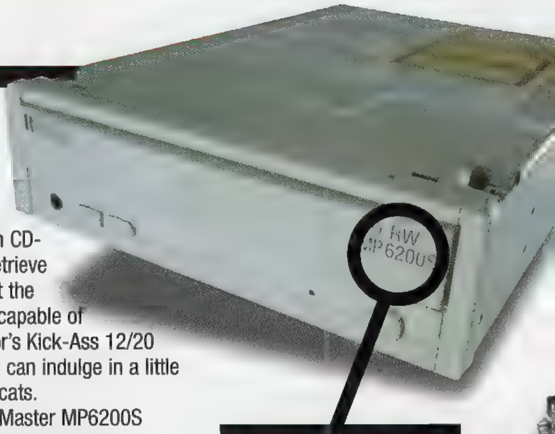
After Windows 95 and the fully-registered version of Quake and all its add-on packs have their say, that 2GB hard drive that came with your system isn't big enough to hide all those 24-bit high-resolution TIF files of Gillian Anderson you scammed off the alt.binaries.pictures.xfiles newsgroup. Not even the almighty PKZIP can shoehorn all this binary goodness onto a single 1.44MB 3.5-inch floppy for archival purposes.

Face it–it doesn't hold squat anymore. What to do? WHAT TO DO?!? Is it time to drag everything lurking inside your PIXXX folder into your Recycle Bin and throw all that time you spent downloading these pretties to the curb?

Nope. Try one of these bootWorthy storage options out for size. Whether you're goin' for the big storage kahuna and wanna splurge for a Gig of removable media, or feel the urge to dupe a little permanent gold on a shiny CD-R disc, we have the solution here to satisfy the storage animal in all of us.

CD-ReWritable Drive

Ricoh **MediaMaster MP6200S**



CHOOSE BETWEEN PERMANENT AND RE-WRITEABLE MEDIA–IT'S ALL GOOD.

The newest format to come waltzing through the bootLabs is the much- vaunted CD-ReWriteable. As the name implies, you can write and rewrite these lil' devils until the cows come home.

While you can write regular old CD-Rs, with CD-RW, there's one big problemo–you'll need to retrieve your newly reburnable data off the CD-RW (not the fastest drive in the world), or a CD-ROM drive capable of reading the new CD-RW media, such as Plextor's Kick-Ass 12/20 Plex drive. Check CD-ROM specs to insure you can indulge in a little CD-RW madness before plucking down the ducats.

A great place to start is with Ricoh's MediaMaster MP6200S internal CD-RW drive. Based around Philip's 2x Write / 6x Read drive mechanism, the MP6200S packs 1MB onboard cache, SCSI-II interfacing, and all the features and functionalities of an ordinary CD-R drive.

product info

Price $600
Company Ricoh
Phone 800.955.3453
URL www.ricoh.com

Yamaha **CDR**400TX

When it comes to permanently etching those archives into a media for mass consumption, nothing beats burning a CD. If you don't own a CD-ROM drive by now, you suck–big time. With CD-R media prices reaching an all-time low, you can now do the dupe for well under $5 a disc.

And forget any other CD-R drive out there–Yamaha's CDR400tx takes care of all your burning needs with a formidable arsenal that makes the once-daunting task of rolling your own CD-ROM quick and painless.

The CDR400tx's SCSI-II terminated behind gives you every format compliance known to *boot*Kind, including CD-ROM, CD-DA, CD-ROM/XA, CD-I, CD-Extra, and Video CD. Its beefy 2MB buffer helps control data flow, while its ultra-quick 600K/sec write and 900K/sec read capabilities means less time staring at a status bar.

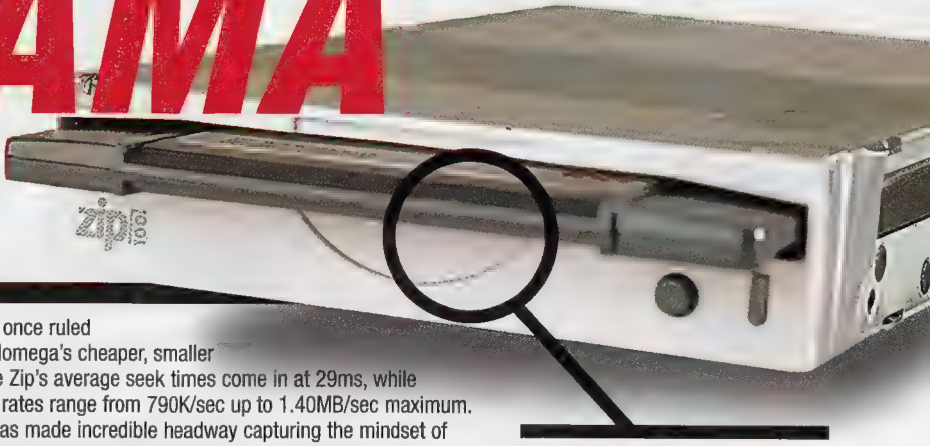
Throw in packet writing, exceptional performance, and a killer software bundle (which includes Adaptec's **Easy-CD Pro 2.1** and DirectCD), and you've got one bomb-ass CD-R.

CADDIES? WE DON'T NEED NO STINKIN' CADDIES!

product info

Price $800
Company Yamaha
Phone 800.543.7457
URL www.yamahayst.com

-O-RAMA



SUPER-THIN AND STURDY MEDIA HIGHLIGHT THIS 100MB LOVE-FEST.

100MB Removable Drive

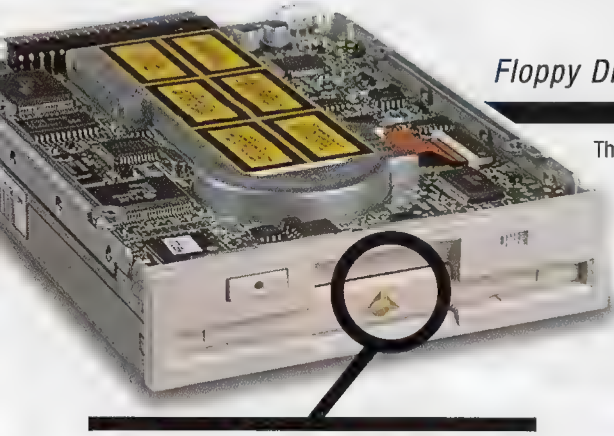
Iomega **Zip**

The current 100MB storage device to beat. Where Syquest once ruled supreme in the "100MB and under" category, along came Iomega's cheaper, smaller and more reliable alternative. With its 32K cache buffer, the Zip's average seek times come in at 29ms, while sustained transfer rates range from 790K/sec up to 1.40MB/sec maximum.

The Zip drive has made incredible headway capturing the mindset of OEM customers and users everywhere. System manufacturers are putting the 100MB drive alongside 3.5-inch floppies as standard storage device, or as an upgrade path. Coming in either external or internal SCSI/EIDE flavors (or hot-swappable in Exabyte's Eagle Nest configuration) and, the Zip's remarkably low profile and thin (but durable) media has made it the floppy-killer the a:drive desperately strives to be.

product info

Price $149
Company Iomega
Phone 801.771.1000
URL www.iomega.com



THIS LITTLE OPENING TAKES BOTH 3.5-INCH FLOPPIES AND THE 120MB SUPERDISK.

Floppy Drive

O.R. **Technology's a:drive**

The :"media formally known as LS-120" is trying to stem the tide of Zip mania. Sliding inside a standard 3.5-inch bay, the a:drive uses dual gap heads to work double duty. Where else can you get 120MB of speedy storage and backwards compatibility with those 1.44MB and 720K floppies?

And if you're worried about having dueling floppies, fear not–the a:drive is a bootable device.

product info

Price internal: $210, media $15
Company O. R. Technologies
Phone 408.866.3000
URL www.ortechnology.com

THE PARALLEL PORT MAY NOT BE THE FASTEST CONNECTION, BUT IT'S PROBABLY THE EASIEST TO INSTALL.

250MB Removable

Avatar **Shark** 250

One of the few removable drives lurking in this seldom-used realm is Avatar's Shark 250.

The drive's initial release was in an external/parallel port design, but now you can dig its 250MB storage capabilities from a PCMCIA or internal IDE drive configuration. For mobile monkeys, the Shark 250 draws power from the keyboard, so you can take the drive and data to a friend's computer for serious TIF trading.

Packing a 128K cache and posting average access times of 3MS, the Shark 250 and its 250MB HARDiskette media handles all types of mobile perils with the greatest of ease. The drive's light weight and durability makes it the perfect companion for notebook user, and the ultra-small footprint and power consumption needs makes the Shark 250 equally powerful at home.

product info

Price $199, 3-pack media $99
Company Avatar
Phone 888.462.8282
URL www.goavatar.com

Best Hardware. Best Software.

Dominate the 3D universe with **Voodoo acceleration.** 3Dfx Interactive delivers the fastest-**amazingly fluid 3D** ever. The **eye-searing graphics** and killer special effects in your game arsenal will now run at **blazing speed.**

"Reigning Champion" – ***boot***/July 1997

Boards packing Voodoo: Diamond Monster 3D, Guillemot Gamer 3D, Hercules Stingray 128/3D, Intergraph Intense 3D Voodoo, Orchid Righteous 3D, RealVision Flash 3D, Techworks Power3D and more.

Hardware Achievement of the Year – *Computer Gaming World* 1997 Premier Awards "For overall no-holds-barred blistering 3D performance...– Diamond's Monster 3D and Orchid's Righteous 3D."

Combining **exceptional software** development with awesome Voodoo acceleration for an unmatchable, **jaw-dropping experience:**

Electronic Arts, Activision, Sierra On Line, Interplay Productions, GT Interactive, Eidos Interactive, Psygnosis, Acclaim Entertainment, Lucas Arts, Microsoft Games, Virgin Interactive Entertainment, Microprose, Sega Entertainment, SegaSoft, Interactive Magic, Westwood Studios, Playmates Interactive Entertainment, Hasbro Interactive, MGM Interactive, Midway Games, Atari Games, UbiSoft, Gremlin Interactive, Bethesda Softworks, Criterion Studios, Mindscape, Accolade, Crystal Dynamics, Fox Interactive, Red Storm and more.

Look for the 3Dfx Interactive logo and see for yourself.

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3Dfx™ interactive

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Product Information Number 374

1GB Removable Drive **Iomega Jaz**

When you play with this many MBs, storage has become more than just a fascination–it becomes an obsession. This realm belongs to hardcore storage junkies who archive material ranging from ultra high-resolution TIF files, full-motion video, to CD-ROM mastering. And here, Iomega once again flexes its storage muscle with the Jaz drive.

Using optimized Winchester hard drive technology, the Jaz's combo of a 256K read/write cache, small form-factor, and massive storage potential makes it one helluva removable beast to beat. While it comes in three flavors, including external parallel and SCSI, and internal SCSI, true storage junkies should opt for the SCSI option, for faster performance.

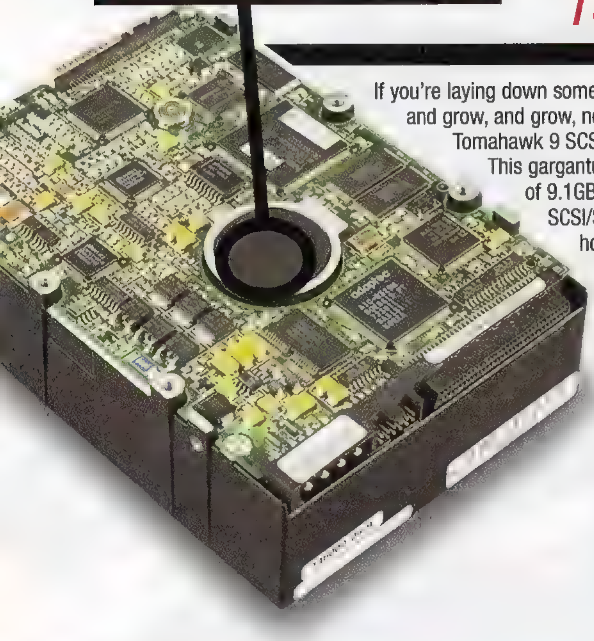
product info

Price external $399, internal $299, media, $89
Company Iomega
Phone 801.778.1000
URL www.iomega.com

WHAT'CHA GONNA DO WITH A GIG OF REMOVABLE STORAGE? START THINKIN' TONNAGE OF TIFS.

IT MAY BE BIG, BUT 9GB IS ENOUGH FOR EVEN THE HUNGRIEST OF STORAGE JUNKIES.

9.1GB Hard Drive
Micropolis Tomahawk 9



If you're laying down some serious video or simply need room to grow, and grow, and grow, nothing could be finer than Micropolis' Tomahawk 9 SCSI hard drive.

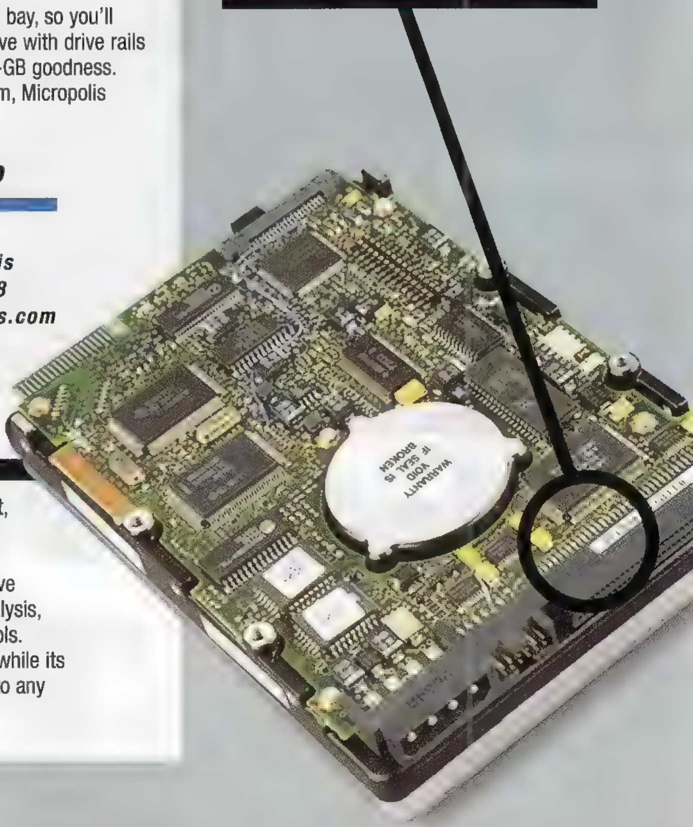
This gargantuan 12-disc drive has a formatted capacity of 9.1GB, and has all the cool features such as Ultra SCSI/SCSI 3, SMART, and SCAM. Transfer rates hover around 1010K/sec.

This thing is huge–it won't fit into a standard 3.5-inch drive bay, so you'll need a free 5.25-inch drive with drive rails in order to taste its multi-GB goodness. But, if you've got the room, Micropolis has the drive.

product info

Price $2900
Company Micropolis
Phone 800.395.3748
URL www.micropolis.com

TIRED OF THE EIDE SHUFFLE? TRY SEAGATE'S 4.35GC SCSI DRIVE ON FOR SIZE.



4.3GB Hard Drive
Seagate **Barracuda 4LP**

While ATA-33 (aka Ultra DMA) is trying feverishly to take hold on the hard drive market, most power-users will agree that SCSI is still the way to go if speed is your highest priority.

Seagate's Barracuda 4LP 4.35GB SCSI drive supports SCSI 3, SMART (Self Monitoring, Analysis, and Reporting Technology), and SCAM protocols. Data transfer rates hover around 1010K/sec, while its thin form-factor means you can squeeze it into any 3.5-inch drive bay.

product info

Price $1100
Company Seagate
Phone 800.732-4283
URL www.seagate.com

PARADISE LOST...

What Went Wrong?

Henrietta Emerson

DECEASED

Age: 64

Retired

Former charity worker and treasurer of the Wives of Foreign War Veterans. Killed tragically during anti-videogame violence protest rally.

Ronald Wanker

DECEASED

Age: 52

Mental Health Technician

Employed at Paradise Psychiatric Center for 27 years. Fatally wounded by multiple bullet wounds.

Jennie Peters

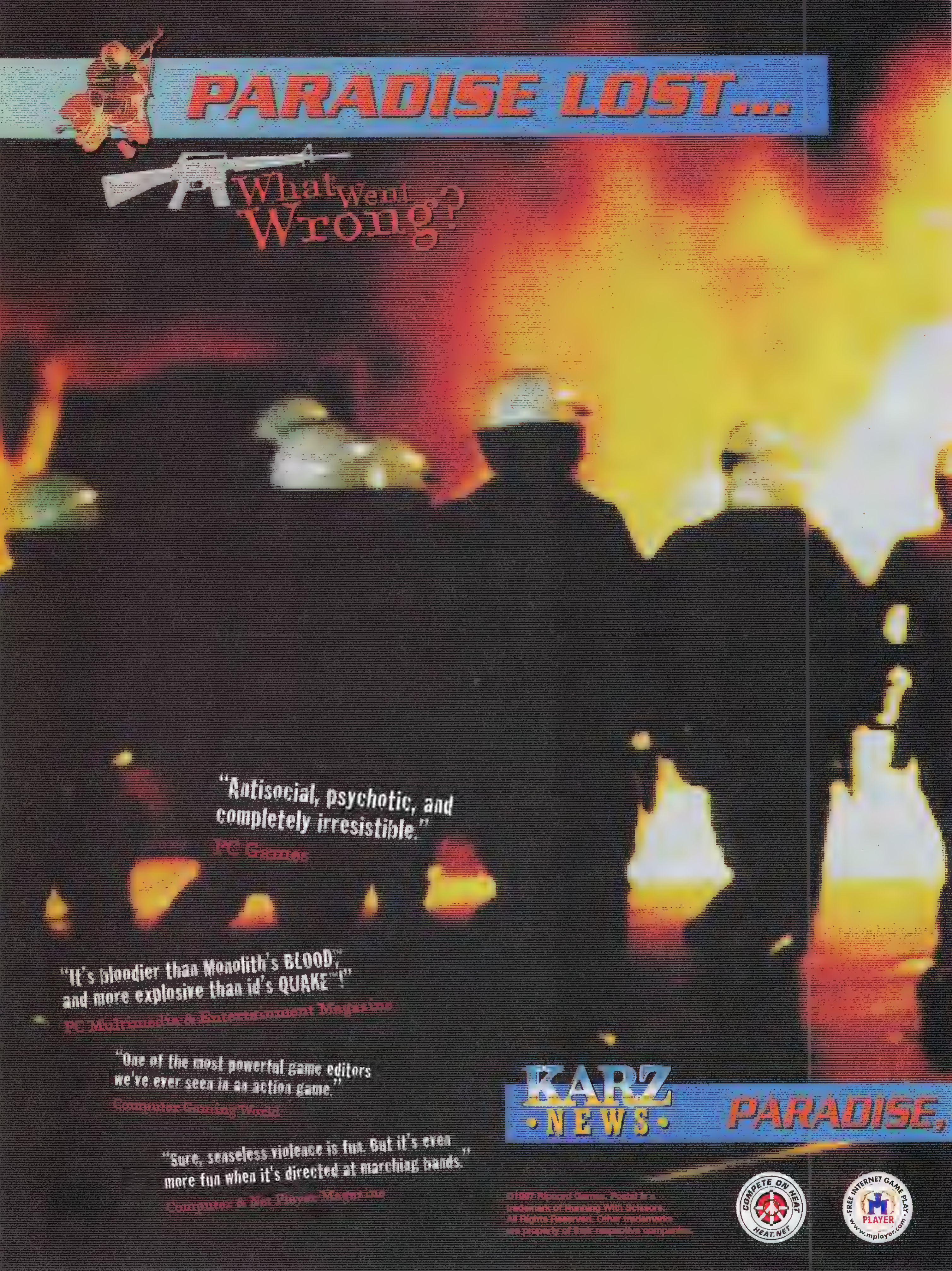
DECEASED

Age: 17

Paradise High Senior

Majorette in local youth marching band. Death caused by 3rd degree burns inflicted by exploding napalm.

KARZ NEWS PARADISE, ARIZONA LIVE


PARADISE LOST...
What went Wrong?
KARZ NEWS
PARADISE,
COMPETE ON HEAT
HEAT.NET
FREE INTERNET GAME PLAY
PLAYER
www.mplayer.com

"Antisocial, psychotic, and completely irresistible."
PC Games

"It's bloodier than Monolith's BLOOD™, and more explosive than id's QUAKE™!"
PC Multimedia & Entertainment Magazine

"One of the most powerful game editors we've ever seen in an action game."
Computer Gaming World

"Sure, senseless violence is fun. But it's even more fun when it's directed at marching bands."
Computer & Net Player Magazine

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ARIZONA LIVE

RUNNING WITH SCISSORS

ripcord GAMES

MATURE M AGES 17+ CONTENT RATED BY ESRB

AND THEY THOUGHT YOU WERE SUCH A NICE, QUIET BOY.

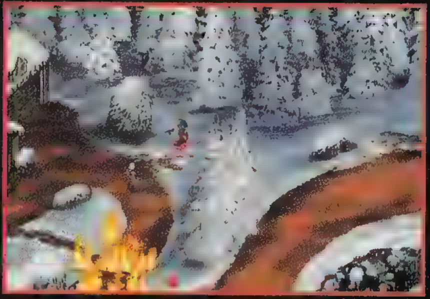
Welcome to Paradise ... Arizona.
They're out to get you (or are they?)

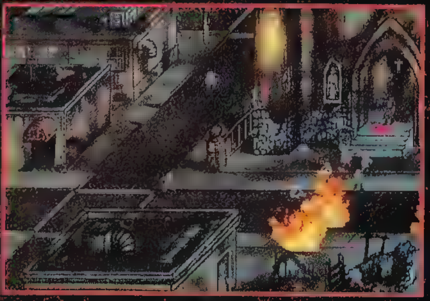
Conspiracy or Insanity? It doesn't matter, you don't have time to think, only time to kill. GO POSTAL!!

Blast, maim and fire-bomb your way through 17 unsuspecting locales. But don't get too crazy out here - strategy is key, so take advantage of the third-person "premeditated" perspective that lets you see exactly who's cold and who's still able to pull a trigger.

- Brutal shooter/strategy combo challenges you to keep one eye on your target and the other looking over your shoulder at all times.
- Real-time 3D characters rage against beautifully hand-painted killing fields.
- So freakin' real, your victims will actually beg for mercy and scream for their lives!
- Multi-player network play over modem, LAN, or the Internet - so you can go Postal with up to 15 other death row candidates.
- Mass murder opportunities: spray protesters, mow down marching bands and char-broil whole towns.
- Complete Game Editor included. No bull, this is the one we used to create the game. Create and manipulate characters, actions and personalities.

The Game Every Gamer Wanted
And No One Else Dared To Make





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Product Information Number 280

POSTAL

Deschutes

The inside story on Intel's next CPU

The top-of-the-line 300MHz Pentium II powers boot*'s Dream Machine 97. This CPU's blazing speed and MMX performance comes bundled neatly in one Nintendo-style cartridge. But now everyone wants to know what's next from Intel? Where is the Pentium II series headed? Well, Intel's next processor is code-named Deschutes and the rumor mill is working overtime speculating about this next-gen processor. How will it be implemented? Will the fabled Slot 2 totally replace Slot 1? When will Intel break the 66MHz barrier?*

boot *went straight to Intel for answers and now you're about to learn the truth.*

intel
pentium II

Don't blink—the next-generation Slot 1 Deschutes will look exactly like every other P-II you've seen.

The New Processor Regime: Almost the same as it ever was

Vanilla Pentiums are fast joining the 486 on the oblivion heap. MMX-equipped Pentiums are becoming entry-level processors. Today's world is marching to the 233MHz, 266MHz and 300MHz beat of Pentium II, with its .35-micron fabrication. Deschutes is simply the next P-II processor, coming in at speeds starting at 333MHz, and packing perks and trade-offs aimed at three specific environments: high-end desktops, workstations, and mobile users. Deschutes promises to make P-II technology available on just about every PC possible.

On the tech side, Intel is shrinking the core CPU down to a .25-micron silicon fab to reduce space and power consumption. Completely compatible with the current P-II's Slot 1, this new processor will buzz with 66MHz system bus speed and 512K of L2 cache, as well as the Error Correction Code (ECC) technology recently introduced with the 300MHz P-II. The L2 cache bus will still run at half the core processor speed—so the 333MHz CPU's cache will run at 166.5MHz. If you're currently invested in the Slot 1 scene, you may be able to dig Deschutes as soon as the processor is released, seeing as many P-II motherboards already support CPU speeds into the 400MHz range.

Intel's impending mobile MMX Tillamook CPU takes advantage of the .25-micron fab used for Deschutes, but the mobile-flavored Deschutes marks the first time Pentium Pro power will come to the notebook arena. Sporting all the Dynamic Execution and Dual Independent Bus architecture you expect, mobile Deschutes uses the closely coupled L2 cache speeds and bus speeds found in current P-IIs, as well as a mini version of the Single Edge Contact cartridge design.

But still, Deschutes' L2 cache will max out at 512K, and Slot 1 systems are still limited to two processors. What if you need a bigger cache? And what about quad P-II power?

That's where Slot 2 comes in.

Slot 2: Bigger and better

Slot 2 will *not* replace Slot 1.

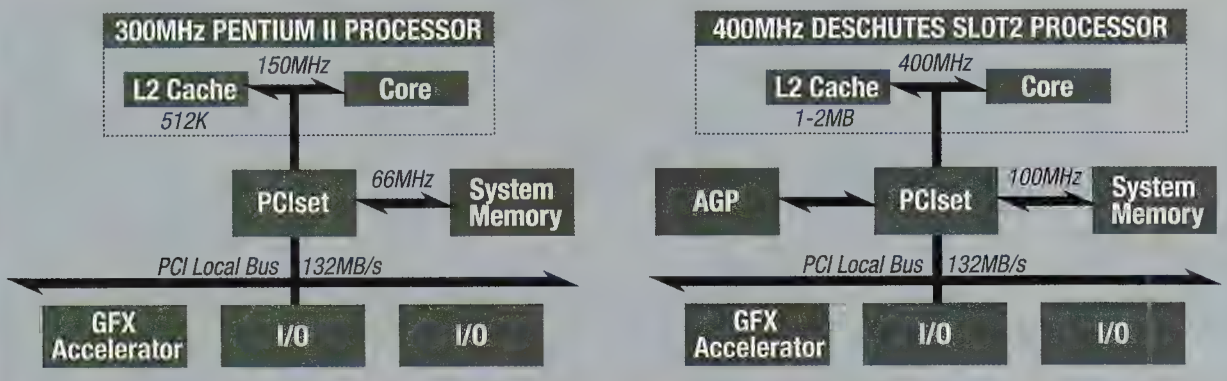
Got that? Good, cause if you think otherwise, we'll hafta smack ya.

Designed to meet the needs of the high-end server/workstation/*Quake II* crowd, Slot 2 is the processor interface for those who need the ultimate processor with no room for compromise, and the Slot 2 Deschutes CPU is just that.

In addition to the vanilla Deschutes' .25-micron fabrication and ECC technology, the Slot 2 Deschutes will run at a 100MHz system bus speed, zipping past Slot 1's 66MHz speed limit (but PCI slots will still run at miserly 33MHz). Intel won't confirm exact processors speeds, but if you invoke the system bus multiplier (3x, 3.5x, 4x, etc.) on the 100MHz system bus, 350MHz, 400MHz and 450MHz parts seem like *high* probabilities.

The Architecture of Your Future Processor

The innards of a Slot 1 processor differ greatly from Slot 2 Deschutes in two big ways, as you can see from this schematic. How fast do you wanna get with Intel? Take a look and see which processor suits your number-crunching needs.



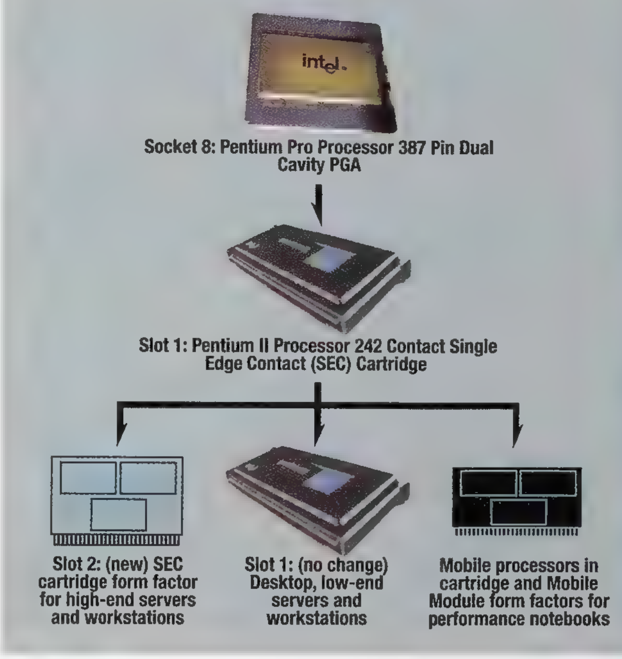
The current generation and forthcoming 333MHz Slot 1 Deschutes will still stay true to current P-II technology. Note the half-speed L2 cache bus and 512K limit. Also, the current PCIset will still limit system bus speed at 66MHz.

This is what you're waiting for: Full speed between the core CPU and a bigger L2 cache, so it's a 400MHz straight pipeline, just like current Pentium Pros. The newer PCIset will handle quad processors and a full 100MHz system bus.

But the most important advances comes in L2 cache implementation. Finally, Slot 2 Deschutes' L2 cache will match the prowess of the Pentium Pro, and run at the same speed as the processor core. That could potentially mean straight 400MHz L2 cache bus speeds (*if* a 400MHz part were to appear). And that ECC L2 cache will exceed 512K. Intel is tight-lipped about specific sizes, but following the current L2 cache trend of doubling the previous limit (e.g., 256K to 512K), 1 and 2MB L2 caches are pretty feasible. And all that additional memory means the new SEC will have a significantly larger form-factor.

[illegible] the P6 Family

The current Pentium Pro/Socket 8 processors are expected to continue their run well into 1998, but it's just a matter of time until you fall in love with a program that requires MMX. By then, you can get into any flavor of Pentium II, whether you're on the go, or stayin' put in front of your CRT.


intel.
Socket 8: Pentium Pro Processor 387 Pin Dual Cavity PGA
Slot 1: Pentium II Processor 242 Contact Single Edge Contact (SEC) Cartridge
Slot 2: (new) SEC cartridge form factor for high-end servers and workstations
Slot 1: (no change) Desktop, low-end servers and workstations
Mobile processors in cartridge and Mobile Module form factors for performance notebooks

Intel had no problem getting inexpensive BSRAM for the first generation P-II's 512K cache, but the bigger L2 cache of Deschutes may force Intel to go back to manufacturing its own L2 cache memory. They're currently doing just that for their P-Pro processors. Another similarity with the current P-Pro processors will be the beefy price tags both CPUs sport. Slot 2 Deschutes should launch well above the $1,000 mark.

Slot 2 also puts quad processor power on tap. But despite the rumors of Intel packing two processors in one hulking SEC, Intel reps assured us that motherboard makers will offer four Slot 2 interfaces. With the enlarged form-factor, putting two CPUs into a single SEC cartridge would be unfeasible, and the heat would go through the roof. Nonetheless, it'll be interesting to see how motherboard manufacturers handle thermal considerations and CPU placement with the quad-processor proposition.

The PCIset/AGP Connection

But what good is all this pure PC power if you don't have the core logic chipset to back it up? As the successor to the battle-hardened 440FX, the 440LX will be available by the time you read this. This PCIset will bring three important new technologies to the table: AGP support (both the 264MB/sec 1x and the 528MB/sec 2x mode), SDRAM support for faster memory throughput, and UltraDMA/33 support for near SCSI-esque transfer rates.

If you buy into a motherboard with the 440LX PCIset now and wonder about AGP support, fear not. With Intel's AGP Virtual Driver interfacing to Windows 95 OSR 2.1 (build 1212) and DirectX 5.0, you'll get the same fully functional AGP as you will with Windows 98, and you'll be ready for some intense 3D graphics.

But the PCIset will only support two processors. If you're jonesing for quad, you'll have to wait until the next-generation multi-processor PCIset is released alongside Slot 2 Deschutes in the second half of next year. Also, AGP 4x should also come riding in with this PCIset.

For those awaiting the true heir to the Pentium Pro throne, the Slot 2 Deschutes solution will be your chance to get down and dirty with MMX processing.

—Andrew Sanchez

product info

Available Deschutes/Slot 1 333Mhz 1H'98; Deschutes/Mobile 1H'98; Deschutes/Slot 2 2H/98
Price TBA
Company Intel
Phone 800.628.8686
URL www.intel.com

The boot Tracking Sheet

TITLE	DEVELOPER	DATE
AMD 640 PCIset AGP	**AMD**	**Oct-97**
Dark Reign	Activision	Oct-97
Age of Empires	Microsoft	Oct-97
Dark Earth	Kalisto/EA	Oct-97
Defiance	Avalon Hill	Oct-97
Extreme Tactics	Media Station	Oct-97
F22 Air Dominance Fighter	DID/Ocean Int'l	Oct-97
Grand Prix Legends	Papyrus	Oct-97
Madden 98	EA Sports	Oct-97
Myth	Bungie	Oct-97
NHL 98	EA Sports	Oct-97
Overboard	Psygnosis	Oct-97
Rebellion	LucasArts	Oct-97
Return to Krondor	7th Level	Oct-97
SandWarriors	Interplay	Oct-97
Sub Culture	Criterion/Virgin	Oct-97
Screaming Demons	Activision	Nov-97
Zork: Grand Inquisitor	Activision	Nov-97
Baseball 3D	Microsoft	Nov-97
Blade Runner	Westwood	Nov-97
Close Combat: A Bridge to Far	Microsoft	Nov-97
Demon Isle	Sierra	Nov-97
FIFA 98	EA Sports	Nov-97
Kings Quest: Mask of Eternity	Sierra	Nov-97
M.A.X. 2	Interplay	Nov-97
NBA Live 98	EA Sports	Nov-97
Populous: The Third Coming	Bullfrog/EA	
Redline	Accolade	Nov-97
Shadows of the Empire	LucasArts	Nov-97
Sid Meier's Gettysburg	FireAxis/EA	Nov-97
Test Drive 4	Accolade	Nov-97
Ultima Online	Origin/EA	Nov-97
Unreal	Epic MegaGames	Nov-97
AMD K6 300Mhz	**AMD**	**Dec-97**
6x86MX-300	**Cyrix**	**Dec-97**
MediaGX MMX	**Cyrix**	**Dec-97**
AMD 640 PCIset/AGP/100Mhz	**AMD**	**Dec-97**
GF-1000 DVD-RAM drive	**Hitachi**	**Dec-97**
10th Planet	Bethesda	Dec-97
3D Baseball	Microsoft	Dec-97
Anachronox	Eidos	Dec-97
CART Precision Racing	Microsoft	Dec-97
Daikatana	Eidos	Dec-97
Deadlock 2	Accolade	Dec-97
European Air War	Microprose	Dec-97
F-22 Raptor	NovaLogic	Dec-97
Falcon 4.0	Microprose	Dec-97
Guardians: Agents of Justice	Microprose	Dec-97
Heavy Gear	Activision	Dec-97
Jack Nicklaus 5	Accolade	Dec-97
Longbow 2	Jane's	Dec-97
Lunatik	Psygnosis	Dec-97
Respect, Inc	Psygnosis	Dec-97
The Dark Project	Looking Glass Technologies	Dec-97
WarCraft Adventures: Lord of the Clans	Blizzard	Dec-97
Wing Commander: Prophecy	Origin/EA	Dec-97
Pentium II 333Mhz	**Intel**	**01/98**
Adrenix	Digital Dialect/PIE	01/98
F22 Total Air War	DID/Ocean Int'l	01/98
MechCommander	Microprose	01/98
Prey	3D Realms	01/98
Quake II	id	01/98
SiN	Activision	01/98
Softimage v4.0 (sumatra)	Microsoft	01/98
Star Trek: First Contact	Microprose	01/98
10th Planet	Bethesda	01/98
The Gatherer	7th Level	01/98
Windows 98/Memphis	Microsoft	01/98
Mobile Deschutes	**Intel**	**02/98**
Anarchy	Microsoft	02/98
Duke Nukem Forever	3D Realms	02/98
MechWarrior III	FASA/Microprose	02/98
OutWars	Microsoft	02/98
Riot	Microsoft	02/98
Star Trek: Klingon Honour Guard	Microprose	02/98
Starship Trooper	Microprose	02/98
Windows NT 5.0	Microsoft	02/1998
Deschutes Slot 2	**Intel**	**03/98**
Crusader III	Origin	postponed indefinitely
Ultima IX	Origin	postponed indefinitely

*These dates are subject to change
**Bold indicates hardware

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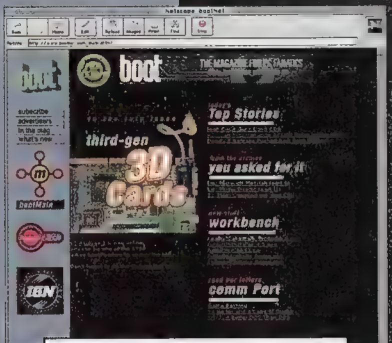
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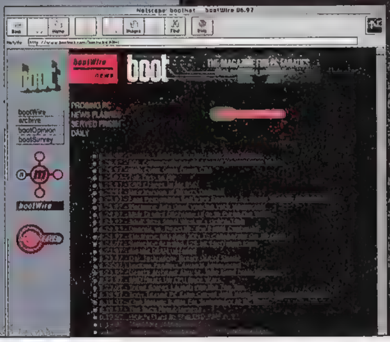
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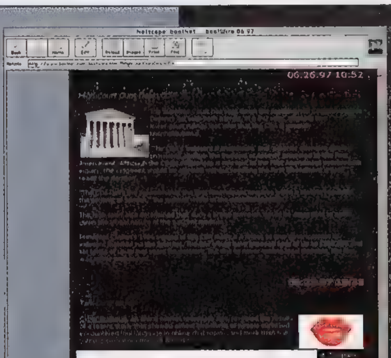
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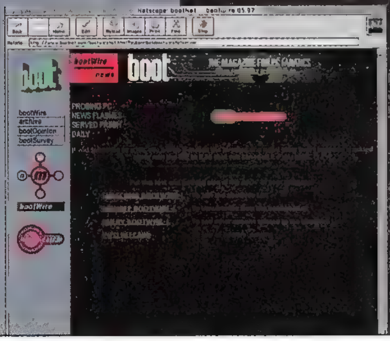
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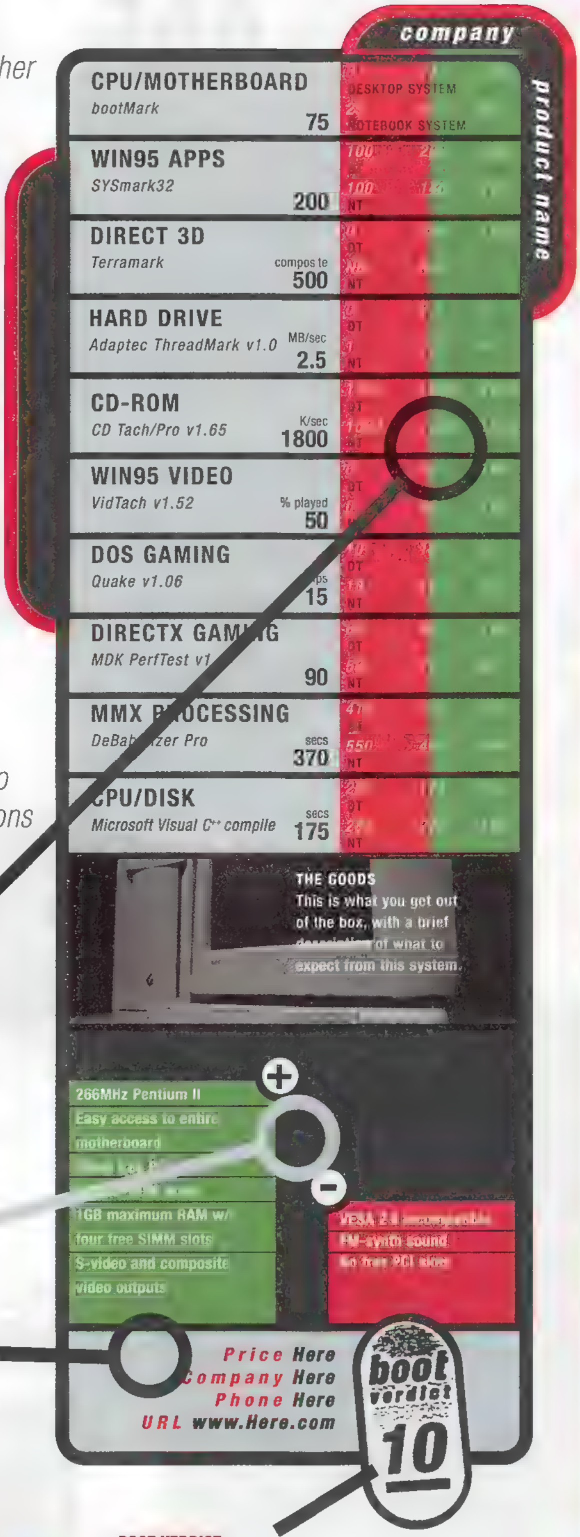
*Our review **scores** are based on a combination of objective **benchmark** testing, real-world performance, and our subjective evaluation of features, performance, and the many less tangible **characteristics** that go into a product. All of our evaluations are based on **hands-on** use of the product.*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FM-synth sound
No free PCI slots
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Company Here
Phone Here
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The new meter has the precise scores for each category benchmarked. Plus, the color bars to the right give you a quick idea of how well the system performed in that category.

It's simple: The farther right the bar reaches, the better the system scored. Green means the system performed on par or beyond what we expect of a current system. If you see nothing but red, the system performed below expectations.

PLUSES AND MINUSES

Here's where we list the best and worst a system has to offer.

CONTACTS

Look here for price, and the company's phone number and URL if you want more information.

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The one that really matters. This score reflects how we feel about a system, taking into account the benchmark results, quality of parts, usability, overall performance, and our intense, under-the-hood scrutiny.

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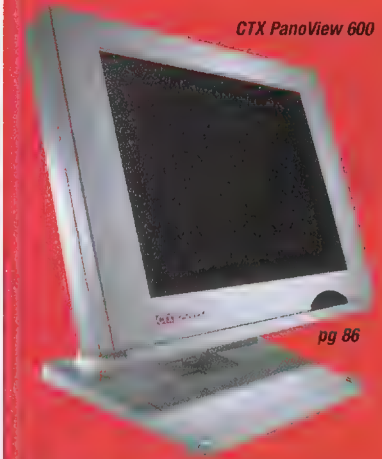
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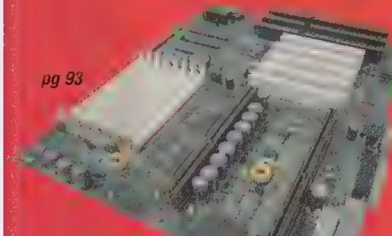

Tyan Motherboards

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Micron Transport XKE

Notebook Nirvana

boot KICK ASS! PRODUCT

Phew! Barely a month after proclaiming Gateway's Solo 9100 to be "the greatest notebook ever," we're puffed with pride in announcing that Micron's new Transport XKE is just as good. In fact, it's even better. *A lot better.*

So what's making us pant like a dog in heat? In a word, everything. From deep down on the motherboard to the top of the beautiful 13.3-inch display, the Transport XKE packs a wallop. All of the component choices are terrific, and the video and audio subsystems pack a lethal one-two punch of inspired performance.

The Transport XKE comes fully loaded. Featuring a genuine Intel Mobile Pentium 166MHz with MMX, 3GB hard drive, and a voracious video, the Transport XKE slapped every benchmark we threw at it. The *SYSmark 32* score and the CD-ROM transfer rate of 2018K/sec. shot off our scale. The *SYSmark* score of 208 is even eight points above the average score of a 200MHz *desktop* machine. It looks like we'll have to revamp our review criteria for notebooks soon.

NeoMagic's new MagicGraph 128XD chipset (equipped with 2MB of DRAM) provides ample video oomph. Full-screen MPEG playback is good, but flickering and ghosting are still apparent. However, the MagicGraph 128XD proves powerful enough to play back *all* 1700 frames of our torturous VidTach AVI test.

Quake's 13.9fps is more than sufficient (but slightly less than the Solo's stellar 15fps.)

The audio subsystem is just as good. At first we thought the Transport XKE utilizes a ho-hum FM-synth chip, but in this case, the ESS1878 FM-chip is also augmented by 1MB of hardware wavetable. And surprisingly, it sounds great—much better in fact, than most of the sound cards we've been forced to listen to lately. The patch set is robust, and the choir effect, in particular, is chilling.

Thanks to the ingenuity of Micron engineers, the video inverter isn't hid on the left side of the screen. Instead, its been integrated into the motherboard with power connections to the LCD routed through the right hinge. Because of this, the screen is nicely centered. Screen flex is kept to a minimum, but the off-axis viewing deteriorates if you lean too far to one side or look down upon the display. Overall, however, the screen is bright and beautiful.

Micron engineers have also been busy tweaking the BIOS settings, and claim the 10-cell 5400mil lithium-ion battery will last upwards of four—four!—hours on a single charge. With power management features turned off, we managed to squeak out more than three hours of continued use during a game of *Quake*.

So what didn't we like? There's no analog brightness or volume controls. All adjustments must be made via the keyboard.

But that's it! Can you believe it? Believe it.

The Transport XKE is the consummate desktop replacement.

–Bryan Del Rizzo

under the hood

THE BRAINS

CPU	Intel Mobile Pentium 166MHz with MMX
L2 Cache	512K synchronous-burst
RAM	48MB EDO DRAM (192MB maximum)
Video	NeoMagic MagicGraph 128XD (2MB EDO DRAM)

THE BRAWN

Hard Drive	IBM 3.0GB
CD-ROM	Sanyo 20X ATAPI
Expansion Bus	Two Type II; one Type III PC Card; CardBus and Zoomed Video Compatible
I/O Ports	One serial; one monitor; one parallel; game port; two PS/2; NTSC; S-Video; USB;
Lap Weight	8 pounds, 6.9 ounces
Carrying Weight	10 pounds

THE BEAUTY

Display	13.3-inch active-matrix screen
Sound	ESS 1878 FM-synth w/hardware wavetable
Video	1024x768, 24-bit color
Speakers	Stereo
Communication	Built-in Motorola 33.6Kbps fax/modem (software upgradeable to 56.6Kbps), dual IrDA ports

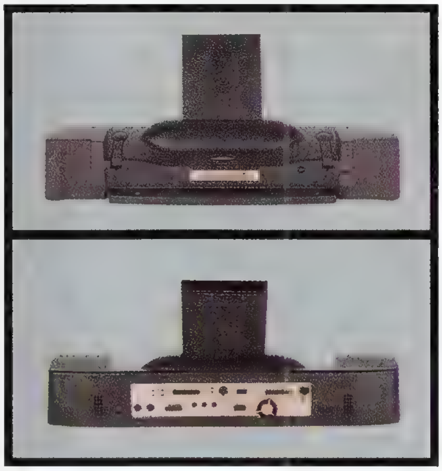
REAL-WORLD BATTERY LIFE 03:21:00

THE BUNDLE Quicken ExpensAble 2.0 | Laplink for Windows 95 | FocalPoint | Greg Norman Ultimate Challenge Golf

boot :43 down :03

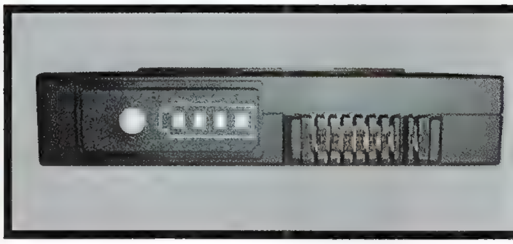
YOU WILL BE REPLICATED

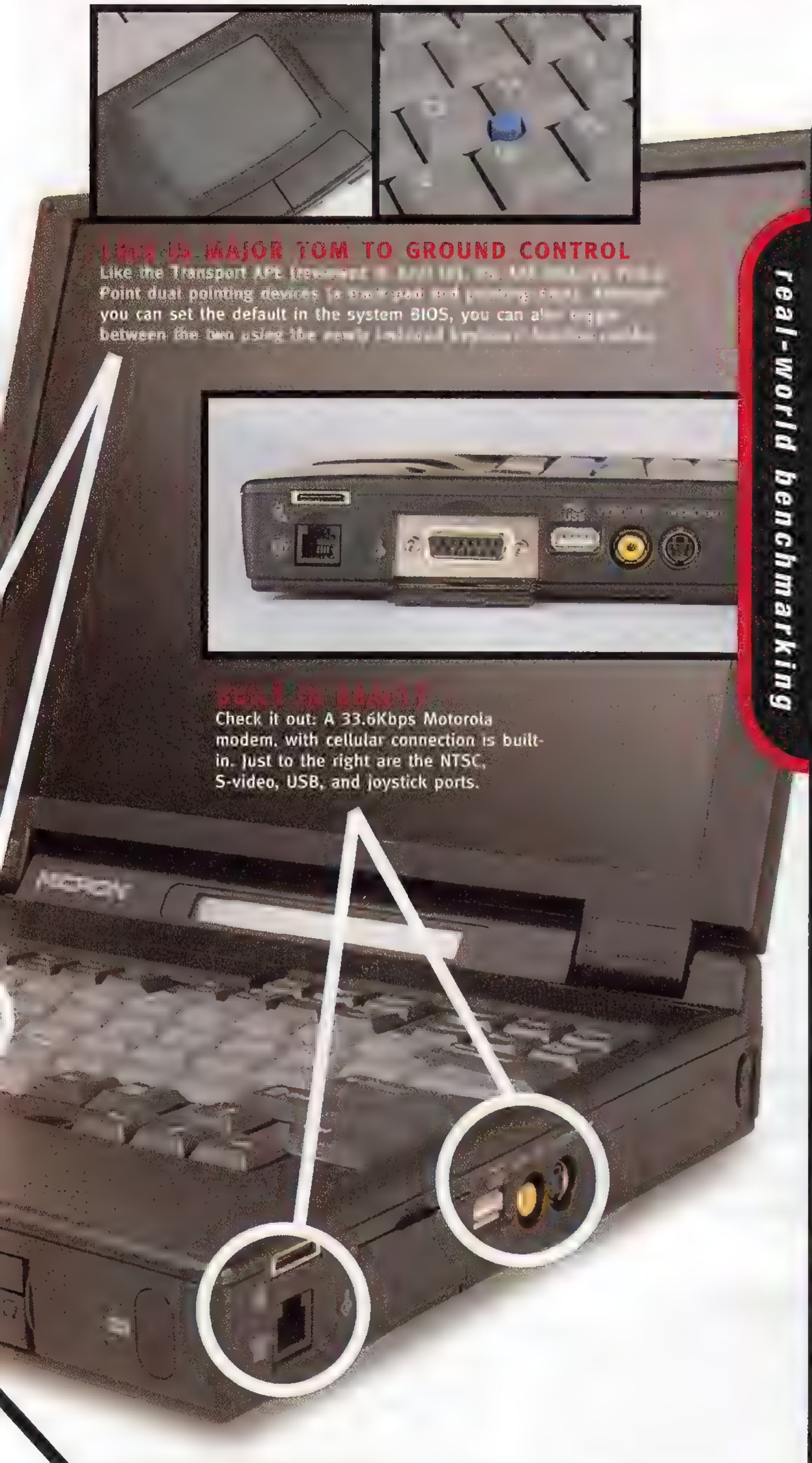
For only $499, you can purchase this most-excellent port replicator featuring an Ethernet LAN adapter, SCSI-2 port, S-Video and NTSC video outputs, built-in stereo speakers, infrared port, and additional parallel, serial and PS/2 ports. There's even a slot on top to recharge the battery. Very cool. It'd be even cooler if the slot accepted those old Atari 2600 cartridges.



SWAP SALE

The battery can be swapped out with either the floppy or CD-ROM drive. But when you're running on AC power, you may as well whip it out.





[illegible] IS MAJOR TOM TO GROUND CONTROL

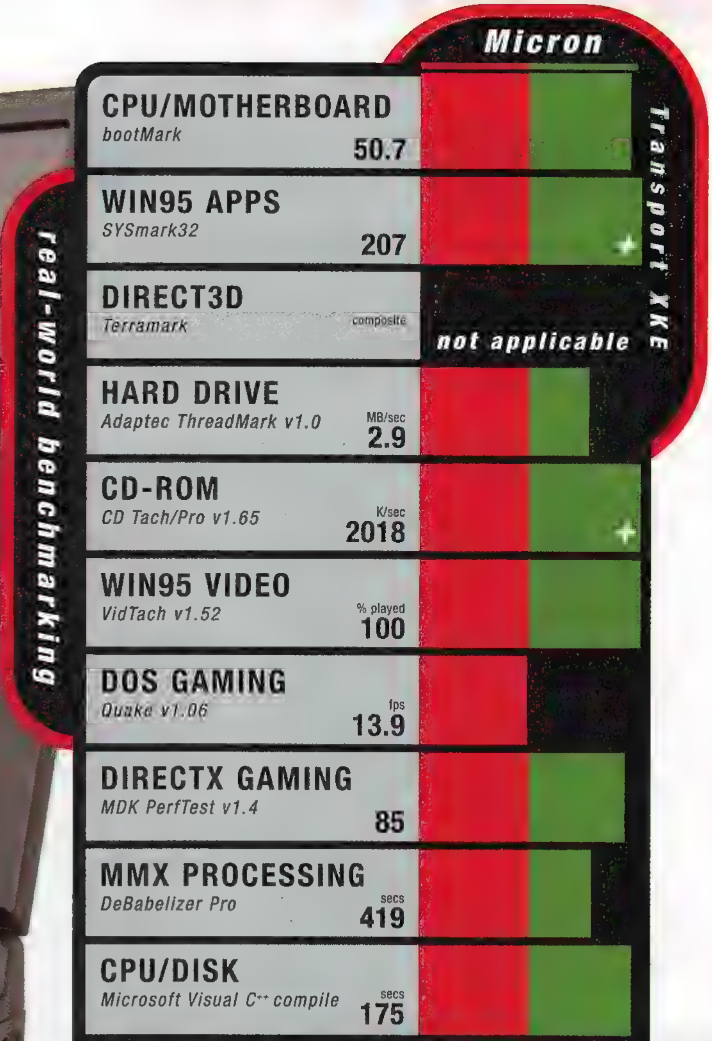
Like the Transport [illegible] Point dual pointing devices [illegible]. Although you can set the default in the system BIOS, you can al[illegible] between the two [illegible]

[illegible]

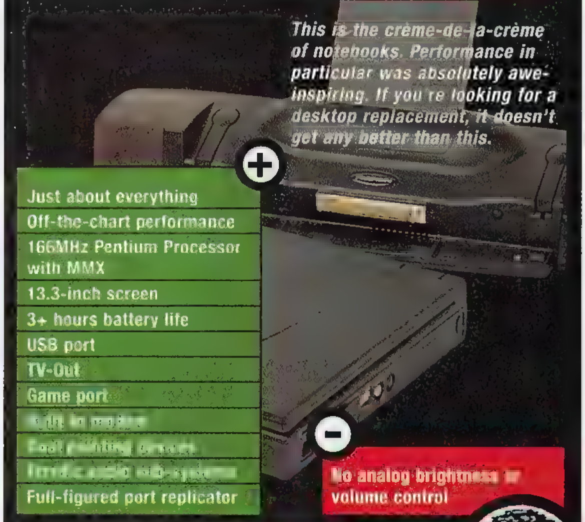
Check it out: A 33.6Kbps Motorola modem, with cellular connection is built-in. Just to the right are the NTSC, S-video, USB, and joystick ports.

EASY-ACCESS CD-ROM

The integrated 20x CD-ROM also features front-panel controls for playing audio CDs.



real-world benchmarking		Micron Transport XKE
CPU/MOTHERBOARD *bootMark*	50.7	
WIN95 APPS *SYSmark32*	207	+
DIRECT3D *Terramark*	composite	*not applicable*
HARD DRIVE *Adaptec ThreadMark v1.0*	MB/sec 2.9	
CD-ROM *CD Tach/Pro v1.65*	K/sec 2018	+
WIN95 VIDEO *VidTach v1.52*	% played 100	
DOS GAMING *Quake v1.06*	fps 13.9	
DIRECTX GAMING *MDK PerfTest v1.4*	85	
MMX PROCESSING *DeBabelizer Pro*	secs 419	
CPU/DISK *Microsoft Visual C++ compile*	secs 175	



This is the crème-de-la-crème of notebooks. Performance in particular was absolutely awe-inspiring. If you're looking for a desktop replacement, it doesn't get any better than this.

+
- Just about everything
- Off-the-chart performance
- 166MHz Pentium Processor with MMX
- 13.3-inch screen
- 3+ hours battery life
- USB port
- TV-Out
- Game port
- Built-in modem
- Dual pointing devices
- Terrific audio sub-systems
- Full-figured port replicator

−
- No analog brightness or volume control

Price $5,399, $499 for port replicator
Company Micron
Phone 800.209.9686
URL www.micronpc.com

boot verdict 10

A complete breakdown of benchmark results is available on the *bootNet.* Point your browser to www.bootnet.com

Lusty LCD Panels

Never too thin, never too rich

Get a glimpse of your future display with one of these skinny beauties. And why exactly should CRTs fear LCDs? Because the new breed is ultra lightweight, comes with super-small footprints, and is thin enough to use on even the most cluttered desktops. Flat-panel LCD production is just picking up steam, so until manufacturers up their glass yields, the first models will be very expensive. But they do make great conversation pieces.

—Andrew Sanchez

Compaq **TFT500**

boot KICK ASS! PRODUCT

Someday, all desktop displays will be 20-inch LCD panels that emit gorgeous colors and maintain high resolutions. Until then, we have Compaq's TFT500 Flat Panel monitor—a smaller, but no less impressive, presentation.

The TFT500 is a 15.1-inch active-matrix LCD panel sporting a natural operating resolution of 1024x768 in 16 millions colors, and measuring just 3.25-inches thick. The flat display is Plug-and-Play compliant, with refresh rates maxing out at 75Hz@1024x768.

The front panel follows a minimalist design, with a power switch and three buttons for on-screen menu access. The menus contain just about every visual control conceived, including clock-phasing and oversize viewing. A USB hub resides on a smallish oval base, with three ports for devices, and one to link with your system.

While it lacks integrated speakers, Compaq offers a molded speaker system that matches the TFT500's curved base. And if you find the base too large, you can elevate the TFT500 with an optional arm mount.

Visually, the TFT500 excites the eyeballs. Off-axis viewing is excellent, and colors are rich and satisfying. High-res images never lose shadow detail, and solid colors remain uniform. MPEG and video playback is just as pleasant. In terms of image quality, the TFT500 is a solid competitor against any traditional CRT, and surpasses most comers in terms of features.

The lone visual deficiency is slight darkness in the extreme corners. Also, when using lower resolutions, stick with the black-bordered mode. The oversize mode scales up into a pixilated mess.

The price of admission is steep, but the TFT500 balances an ultra-small footprint with gobs of useful features and excellent performance.

Price $4,999
Company Compaq Computers
Phone 800.345.1518
URL www.compaq.com

boot verdict 9

Thin and sexy, Compaq's TFT500 will make even Courtney Cox jealous.

CTX **PanoView** 600

The PanoView 600's base takes up a mere 7.5x10 inches of real estate on your desktop or wall. Measuring just over 1.8 inches thick, and mounted on a swing-arm, the PanoView 60's 12.1-inch active matrix TFT panel presents pixels at 800x600@75Hz (in 16 million colors). Full screen 640x480 is also available via the panel's Oversize setting. The PanoView, like the Compaq, requires no special video card.

Four front-mounted buttons grant access to on-screen control for all your adjustments, including volume control for the twin self-amplified speakers integrated in the bottom corners of the panel, and control over four modes of spatial sound enhancements. A power switch, 15-pin D-sub connector, audio connectors, and 5-pin DIN power connector lurk in the rear.

The PanoView 600's visual performance is uneven at best. Off-axis viewing goes downhill past 30 degrees, and the panel suffers from serious glare issues. Color richness also lags. Blacks never attain true darkness, and vibrant images wash out and appear dull when compared to CRT counterparts. The speakers are best left for casual listening, with frequency response centering in the upper midrange area, despite all the aural bells and whistles. Also, the panel emits an annoying click when changing resolutions. Thankfully, the 600's solid refresh rate keeps long-term viewing from causing eye-strain, and MPEG and video playback comes through without any stray artificating or shearing.

The CTX PanoView 600 is a great demonstration of what the future holds, but we wouldn't rush out to join this particular flat-panel line just yet.

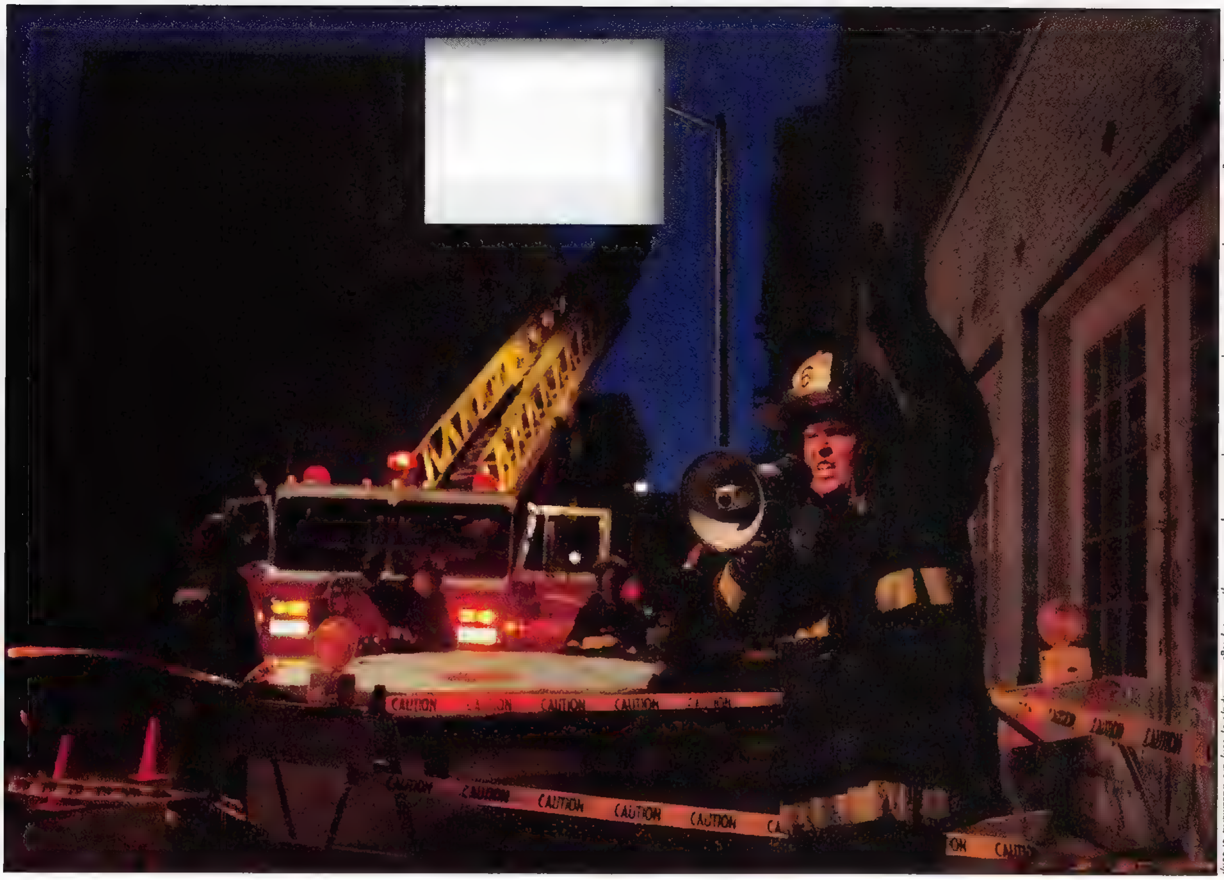
Price $2,300
Company CTX-Opto
Phone 408.541.6060
URL www.ctxopto.com

boot verdict 5

CTX PanoView

With poor off-axis viewing and washed out colors, it's hard to love the CTX PanoView 600.

SONY



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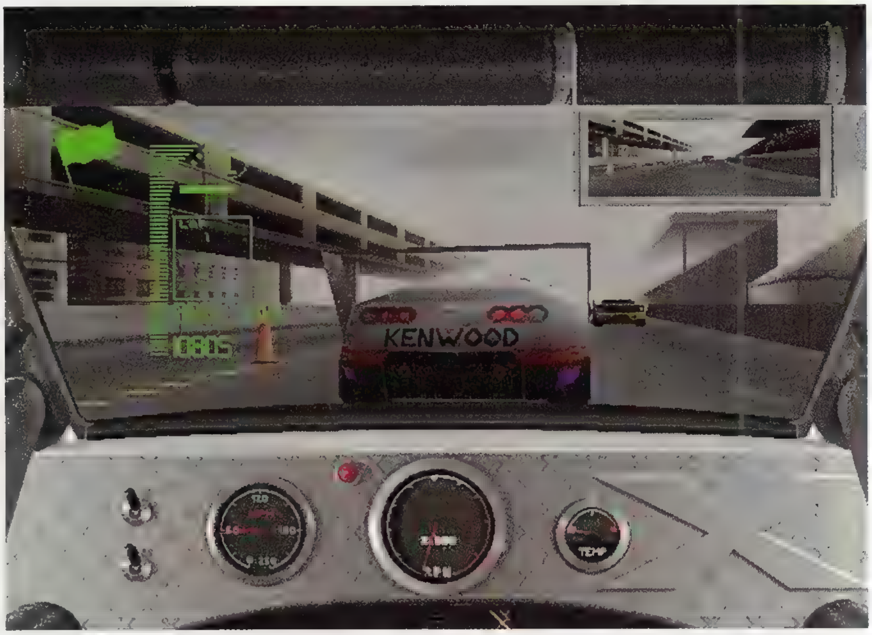
Emergencies happen. Your display goes on the blink. Sony's exceptional technical support is there, 24 hours a day, 7 days a week, with help available via fax, online and phone (with an average hold time of just over 30 seconds). And with 27 Sony-owned service centers nationwide, you're sure to get a quick and easy response. For eligible customers, we offer the Sony Express Exchange Program to get you a replacement display within 48 hours. And for qualified accounts, Sony offers a Worldwide Service and Support Program delivering reliable help with a single phone call. Emergencies will happen. **But what counts is what happens after they happen.**

displays *by* sony

To see the whole picture, visit our website at www.sony.com/displays2 or call us at 1-800-352-7669.

X-Car: Experimental Racing

Tossin' Trixie to the curb

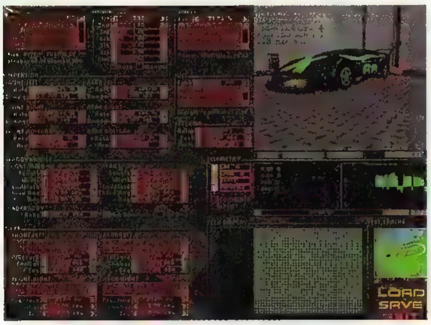


Rev up the Xngine and get behind the wheel of awesome prototype cars in Bethesda's new race sim **X-Car.**

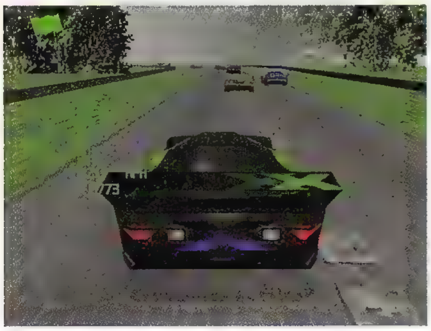
With enough vehicles to make Speed Racer go "ooohh!," *X-Car: Experimental Racing* is as close as you're going to get to owning a prototype closed-wheel car without donning a crash helmet and fire-retardant suit.

More than a mere racing extravaganza, this DOS-native sim is a fully customizable tweaker's paradise. In *X-Car* you'll wear multiple hats. As head engineer, you control every aspect of your experimental car's design. Once you've settled in on a hearty balance of power and poise, take your would-be Mach 5 out to any of the closed-loop tracks and see how good your new ride really is.

The optimized XnGINE rumbling under the hood revs up *X-Car's* sharp SVGA graphics, which are the best Bethesda has produced to date. While a VESA-compliant (playable up to 800x600) video card delivers impressively playable frame-rates hovering around 20fps, which is more than most 3D engines muster, XnGINE's has finally learned to GLIDE. With 3Dfx-powered acceleration X-Car runs in a variety of 640x480 vantage points, and the texture-mapped polygon tracks zoom by at over 24fps, even when pushing over 18,500 triangle. Your opponents fly by, averaging 175 polys per vehicle.



In **X-Car's** *in-depth virtual laboratory, you can fudge around with any aspect of your vehicle.*



No Direct3D for you! **X-Car** *currently support's 3Dfx's GLIDE API—so there!!!*

Still, if you've seen the butter-melting framerates of 3Dfx/MMX-enhanced *Pod* or PowerVR-enhanced *Ultim@te Race*, you'll find *X-Car* stuck in low gear, especially with the 16- to 256-pixel-count filtered texture maps.

Effects galore adorn *X-Car's* racing environment—unfortunately, some are better than others. The terrain is dotted with a combination of texture-mapped polygons and sprites, while the overhead clouds are *Mechwarrior II*-esque. Too bad bethesda used a blocky bitmap for the horizon graphic.

✓ CHECK**LIST**

Maximum Resolution/Color
800x600/8-bit (VESA),
640x480/16-bit (GLIDE)
MS-DOS
Hardware Acceleration
3Dfx
Multiplayer
Modem Direct/serial
IPX (8 players)

Crash into a guardrail at high-speed and polygon wreckage is strewn the track while semi-transparent smoke billows from your hood. Cruise through dreary Seattle and you'll pierce the distant fogging and super-imposed rain upon your windshield. While it ain't bad in the first-person view, a glance overhead reveals the same rainfall that's used for the forward view—tres tacky.

Unlike the accelerate-and-forget mentality of arcade cruisers such as *Ridge Racer* and *Daytona USA*, there are two modes of operation within *X-Car*. For you instant-action types, there is a "race-til-you-drop" mode with fantasy physics and barely any damage. But real racers will rise to the "realistic" fully modeled challenge and take part in some uber-real racing. It takes a while to get used to the uncompromising physics engine, but if *Carmageddon* got you hot and bothered, you'll really dig X-Car's swerves and turns, minus the manslaughter. With the almost endless variety of modifications, you'll be spending many a sleepless night tweaking your car to perfection. If you really wanna customize your ride, take the bundled *Xpaint* program for a spin and bitmap your own logos and graphics, although a multi-level undo is sorely lacking—guess that's why *Photoshop* was invented, eh?

The race for the PC driving game checkered-flag is filled beyond capacity, but *X-Car's* combination of slick graphics, downloadable cars, and endless replayability makes it finish in the money.

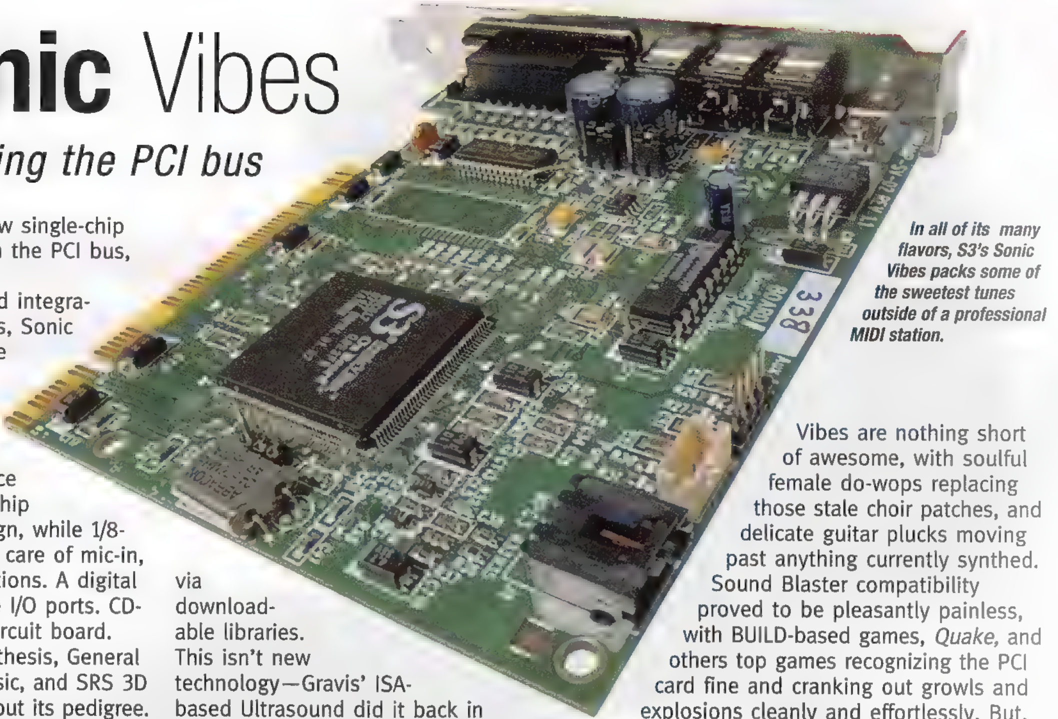
— *Andrew Sanchez*

Price $45
Developer/Publisher
Bethesda Softworks
Phone 800.677.0700
URL www.bethsoft.com

boot
verdict
8

S3 **Sonic** Vibes

Sexy sound riding the PCI bus



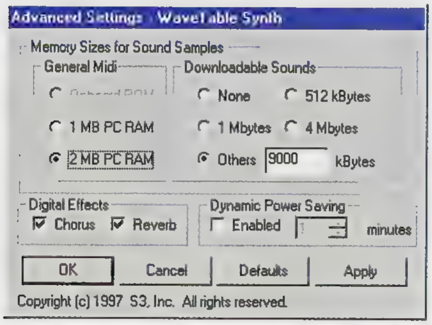
In all of its many flavors, S3's Sonic Vibes packs some of the sweetest tunes outside of a professional MIDI station.

Sonic Vibes is S3's sexy new single-chip total sound solution. It's on the PCI bus, and it sounds phenomenal.

Destined for motherboard integration and add-in sound cards, Sonic Vibes' memory flavors range from configurations using on-board ROM (1, 2, or 4MB) to ROM-less variants that rely solely on system memory for 32+ voice GMIDI patches. The single chip makes for clean board design, while 1/8-inch stereo connectors take care of mic-in, line-out, and line-in connections. A digital joystick port rounds out the I/O ports. CD-audio inputs also dot the circuit board. Support for SB Pro, FM synthesis, General MIDI, DirectSound, DirectMusic, and SRS 3D audio enhancements round out its pedigree.

Sound Blaster Pro emulation—in Windows and full DOS mode—is accomplished via the S3LEGACY.COM TSR, but you'll need a PCIset that supports distributed DMA in order to enjoy pure SB satisfaction.

The main GMIDI patch set has been certified by FAT Labs, and Sonic Vibes struts its stuff with InfiniPatch technology, which provides unlimited patch palettes via downloadable libraries. This isn't new technology—Gravis' ISA-based Ultrasound did it back in 1992—but this time S3's doing it over the PCI bus, and grabbing system RAM as needed. Developers can create Sonic Vibes libraries (DLS), and download these custom patches into their programs. Why dick around with a synthesized Choir Aahs patch when you can download real choir voices and play them instead? Since they're triggered by plain ol' MIDI instructions, programming your music is a Cakewalk Pro composition away. S3's DLS manager can open various libraries and drag-and-drop them into your current MIDI configuration for custom sounds.



Advanced Settings · WaveTable Synth

Memory Sizes for Sound Samples

General Midi

○ 1 MB PC RAM

● 2 MB PC RAM

Downloadable Sounds

○ None ○ 512 kBytes

○ 1 Mbytes ○ 4 Mbytes

● Others 9000 kBytes

Digital Effects

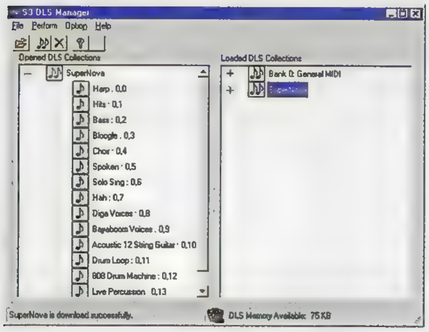
☑ Chorus ☑ Reverb

Dynamic Power Saving

☐ Enabled minutes

Copyright (c) 1997 S3, Inc. All rights reserved.

While you have control over reverb and chorus, you won't have access to incremental adjustment. Bah!



S3 DLS Manager

Opened DLS Collections

- SuperNova
  - Harp : 0,0
  - Hits : 0,1
  - Bass : 0,2
  - Boogie : 0,3
  - Choir : 0,4
  - Spoken : 0,5
  - Solo Sing : 0,6
  - Hah : 0,7
  - Diga Voices : 0,8
  - Bayaboom Voices : 0,9
  - Acoustic 12 String Guitar : 0,10
  - Drum Loop : 0,11
  - 808 Drum Machine : 0,12
  - Live Percussion : 0,13

Loaded DLS Collections

- Bank 0: General MIDI

SuperNova is download successfully.

DLS Memory Available: 75 KB

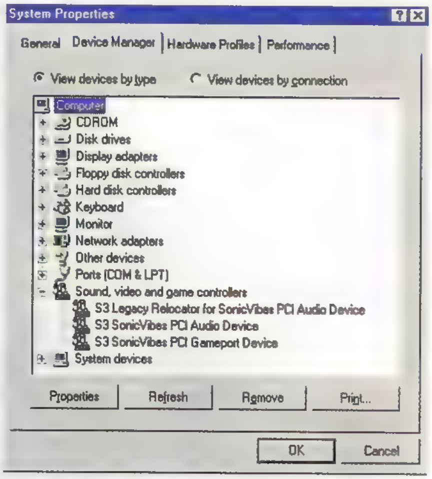
From here, drag-and-drop your opened DLS collections so you enjoy new samples and enter smooth MIDI heaven.

Unfortunately, Sonic Vibes is an I/O address resource hog, with the PCI audio section taking up one IRQ and five memory addresses! Sound Blaster Pro emulation uses a single IRQ and DMA, but takes two more memory addresses, and the game port takes up another memory address.

The sound quality with Sonic Vibes depends on whether DLS libraries are used. As a 2MB GMIDI device, the stock patches sound impressive, with guitars, pianos and drums landing solid and authentic. The only flies in the ointment are the horns and strings, which don't sound real.

Nonetheless, if you don't dig the current patches, you can download new ones to make your MIDI songs soar. Coming up with your own sample sets and integrating them into a new library is daunting, so the Sonic Vibes' fate lies in the hands of content developers. They'll have to create proper DLS files with their software to milk maximum sonic pleasure out of the Sonic Vibes. The demos that ship with Sonic Vibes are nothing short of awesome, with soulful female do-wops replacing those stale choir patches, and delicate guitar plucks moving past anything currently synthed.

Sound Blaster compatibility proved to be pleasantly painless, with BUILD-based games, *Quake*, and others top games recognizing the PCI card fine and cranking out growls and explosions cleanly and effortlessly. But, according to Intel's Media Benchmark, the Sonic Vibes utilizes 16.7% of the CPU—a far cry from the 9% we saw with Ensoniq and Diamond's PCI sound soundcards.



System Properties

● View devices by type ○ View devices by connection

- Computer
  - + CDROM
  - + Disk drives
  - + Display adapters
  - + Floppy disk controllers
  - + Hard disk controllers
  - + Keyboard
  - + Monitor
  - + Network adapters
  - + Other devices
  - + Ports (COM & LPT)
  - − Sound, video and game controllers
    - S3 Legacy Relocator for SonicVibes PCI Audio Device
    - S3 SonicVibes PCI Audio Device
    - S3 SonicVibes PCI Gameport Device
  - + System devices

Three device drivers get the Sonic Vibes singing—just don't ask how many I/O addresses it takes.

Once developers come up with patches for the Sonic Vibes, this card could herald the return of CD-audio quality MIDI music on the PC platform. But even if this is just a teaser of things to come, S3 has a great sonic future.

— *Andrew Sanchez*

Price $100
Company S3
Phone 408.588.8000
URL www.s3.com

boot verdict 8

CH
GAMESTICK
ADVANCED ABSOLUTE
GAMESTICK • GAMESTICK 14
USA MADE
THREE YEAR 3 WARRANTY

**overpowering. deadly. abusive.
the ultimate domination tool.**

it's even better when plugged in.
the stunning new
gamestick
from CH products.

there is nothing like it.
anywhere.

gamestick.
the future is here.

760.598.2518 www.chproducts.com

Product Information Number 110

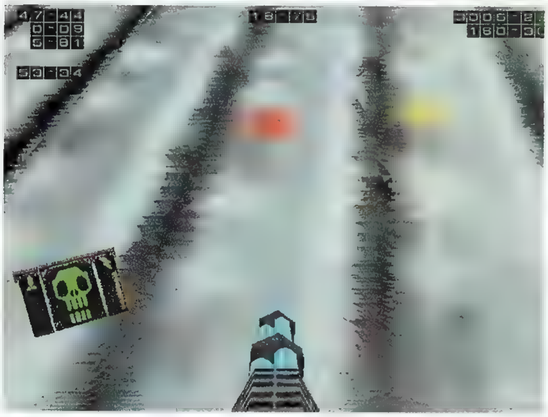
Best Buy Chips & Bits Circuit City Comp USA Computer Express Cyberian Outpost Egghead Electronic Boutique Flight Sim Central Fry's Electronics High Flight J & R Computer Micro Center Musicland Office Max Sears Software City Target The Good Guys! Thinkstuff United CD-Rom PC Connection

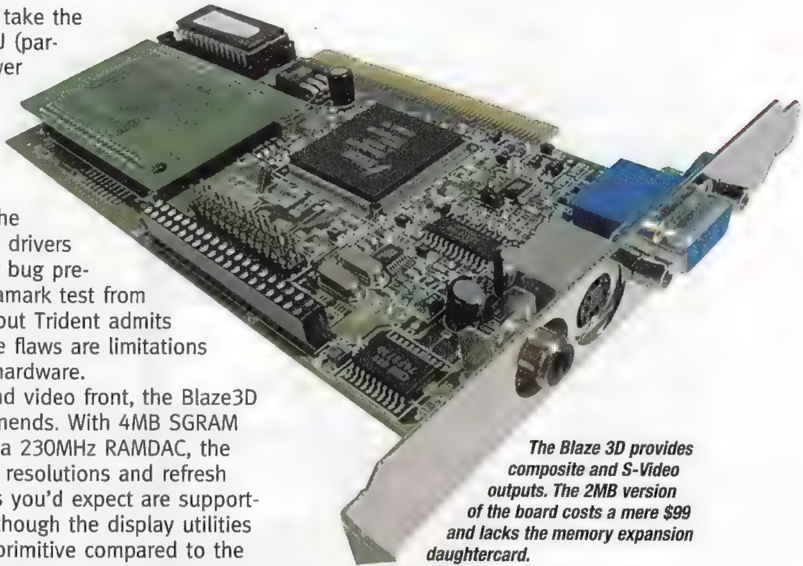
Jaton **Blaze3D** Ultimate

Trident's new 3D chipset is ultimately flat

When a 3D card's software bundle consists of titles that don't support 3D acceleration, beware. There is no surer sign that despite an "ultimate" billing, the actual 3D performance will leave you flat. Of all the 3D cards that have passed through the bootLab recently, only boards based upon the Cirrus Logic Laguna 3D chip left us flatter than the Jaton Blaze3D Ultimate.

Like the Laguna 3D, severe visual flaws plague the Trident 3Dimage 975 chipset that powers the Blaze3D. Textures look warped, filtering appears distorted, and, thanks to precision problems within the chip, flat surfaces ripple like Lake Superior on a windy day. Looking at the arena in Hyperblade actually makes you seasick, and although the effect may be appropriate in TigerShark, it's not pleasant. Transparency isn't properly supported as well, and though the hardware triangle setup engine does help speed polygon throughput and take the load off the CPU (particularly on slower machines), the end results just aren't worthwhile. Some of the problems may lessen as the Trident Direct3D drivers mature (a driver bug prevented our Terramark test from running at all), but Trident admits that many of the flaws are limitations intrinsic to the hardware.


It's hard to even tell this is a screen shot from Terracide*—textures on the Blaze 3D look so bad up close that you may think you're playing through the fly's distorted point of view in* Dungeon Keeper*!*


The Blaze 3D provides composite and S-Video outputs. The 2MB version of the board costs a mere $99 and lacks the memory expansion daughtercard.

On the 2D and video front, the Blaze3D tries to make amends. With 4MB SGRAM and a 230MHz RAMDAC, the high resolutions and refresh rates you'd expect are supported, though the display utilities are primitive compared to the spit-and-polish utilities from Diamond, Matrox, and ATI. DOS and Windows performance is good, if not great, and thankfully VESA 2.0 support is provided in hardware.

Video is the one area where the Blaze3D actually excels, providing quality NTSC-out. This allows you to use your television as a monitor, a remarkable feature on such an inexpensive board. The MPEG playback quality of the Blaze3D is better than most, with minimal pixelation and background flashing, and the video scaler deals well with stretching video to full screen at all but 1600x1200.

The Jaton Blaze3D fails to excel in any areas, and truly disappoints us as a 3D accelerator. Take a hint from the un-accelerated software bundle composed of yesterday's bargain bin games, and avoid this disappointing package—unless for some reason you really need a TV-out enabled graphics board for cheap.

— *Chris Dunphy*

Blaze 3D

Max 24bit resolution/refresh	*1024x768/75Hz*
Max 16bit resolution/refresh	*1600x1200/72Hz*
VESA 2.0 Support	*Yes*
Virtual Desktop Support	*No*
MDK Perf-Test	*94*
Ziff Davis 3D Winbench	*63.6 (had to disable strips and fans)*
Winmark'97 10x7x16	*72.7 / 28.3 **
Winmark'97 10x7x32	*45.7 / 21.4 **
Winmark '97 16x12x16	*58.9 / 26.9 **
Quake 640x480	*12.8fps*
Quake 800x600	*8.4fps*
TerraMarks (Level 1/2/3)	*failed*

** Business Graphics Winmarks / High End Graphics Winmarks*

Trident 3Dimage 975

The Trident 3D Image 975 chip that inhabits the Blaze3D looks like a dream come true… on paper. With an integrated 230MHz RAMDAC, hardware triangle setup engine, a large 3D feature set, impressive video, and support for dual video windows, it doesn't look like there's much this chip can't handle. But, sadly, it fails to live up to its potential.

The setup engine proves to be the chip's Achilles heel. Rather than doing its calculations in floating point, the Trident 975 uses fixed precision arithmetic that results in unacceptable visual quality flaws. Surfaces seem to shimmy as they oscillate slightly back and forth in space while the camera stands still. It is a subtle though disturbing effect.

The bilinear filtering algorithm leaves a lot to be desired, too, with filtered textures looking more like they have been through an earthquake than a smoothing process.

The 3Dimage 975 proves to be yet another 3D chip for the junk bin. Is Trident headed down the same path of mediocrity that Cirrus and S3 have been blazing, or will its next chip actually catch the paper tiger the others have been running around? Stay tuned.

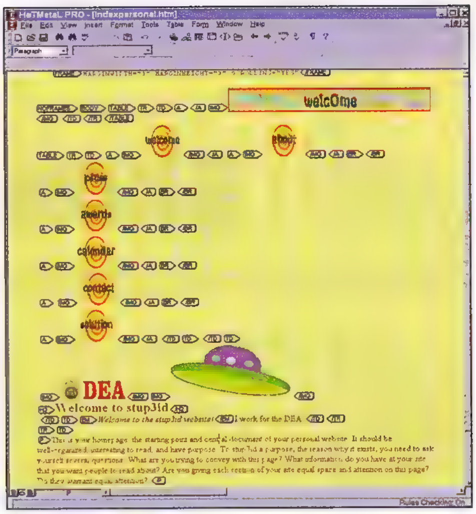
BUNDLE: **Virtua Fighter PC, Daytona USA, TriSpectives**

Price ***$129 (4MB SGRAM)***
Company ***Jaton***
Phone ***408.934.9369***
URL ***www.janton.com***

boot verdict 4

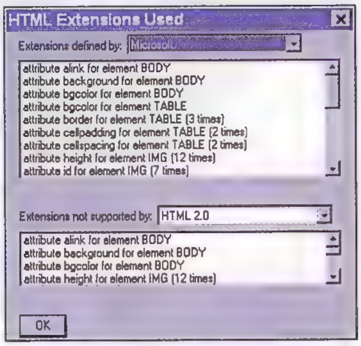
HoTMetaL Pro 4.0

Pedal to the metal


Tags-On mode will make the most adept of HTML coders happy. Tags stand out clearly, and can't be accidentally deleted unless you disable error-checking.

If you're an HTML whiz thinking there's no reason to look at anything beyond *WordPad*, think again—*HoTMetaL Pro 4.0* is the one tool you'll find uniquely compelling.

Newcomers to HTML will also find the program amazingly capable, full-featured, easy to learn and competitively priced, but *HoTMetaL* is clearly geared towards the power-coder; the macro recorder gives this away immediately. Tags-On editing mode is somewhere between source editing and WYSIWYG (both of which are also well-supported), and presents HTML tags in a stand-out fashion, making it much easier to tell them apart from your content. By default, the tool also prevents you from creating invalid HTML, and is easily extended to support new and non-standard tags, either via SoftQuad's web-served rules files or *HoTMetaL*'s HTML Element Wizard. Checking compliance with various versions of HTML and web browsers is just as easy, and there's a global context-sensitive search-and-replace function for quick site-wide modifications.


HTML Extensions Used

Extensions defined by: Microsoft

attribute alink for element BODY
attribute background for element BODY
attribute bgcolor for element BODY
attribute bgcolor for element TABLE
attribute border for element TABLE (3 times)
attribute cellpadding for element TABLE (2 times)
attribute cellspacing for element TABLE (2 times)
attribute height for element IMG (12 times)
attribute id for element IMG (7 times)

Extensions not supported by: HTML 2.0

attribute alink for element BODY
attribute background for element BODY
attribute bgcolor for element BODY
attribute height for element IMG (12 times)

In case you forget those tags that only work in IE or want to make sure all your tags are HTML 2.0, HoTMetaL Pro will gladly remind you.

All the other goodies we've come to expect from an HTML editor are included as well, such as WYSIWYG frame, table and form editing, wizard-driven site creation, and quick client-side image mapping. Although poorly named, the Information Manager's Web View sports the coolest, most useful overview of an entire web site we've seen; it's almost worth the product's price just to drag the link-tree around the window. And *HoTMetaL* Pro does an admirable job of importing all standard word-processing, spreadsheet and image files into HTML form, while preserving the original formatting of your documents.

Need more reasons? How about included third-party tools for Java, VRML, source version-control and animated GIF creation? Hot, indeed!

— *Neil Redding*

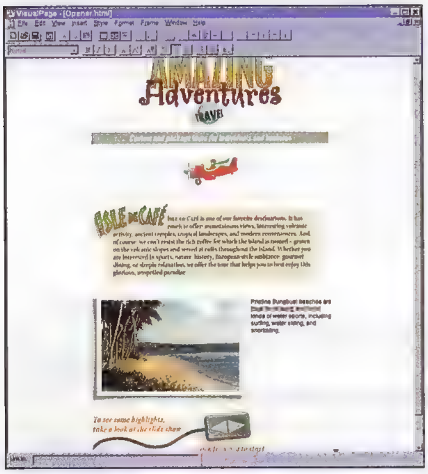
Price $129 ($69 upgrade from previous versions or competitive products)
Developer SoftQuad
Phone 800.387.2777
URL www.softquad.com

boot verdict 8

Visual Page

WYSIWYG wishes, HTML delights

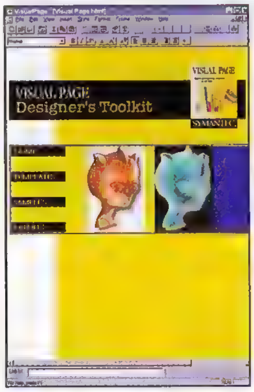
Just when you thought it was safe to buy some other WYSIWYG HTML editor, Symantec went and upped the ante in the elegance department with *Visual Page*.


Visual Page is the only editor around that lets you preview Java applets during page editing, thanks to its included Java VM.

You've never seen smoother, better-integrated web-page authoring than this.

Not that *Visual Page* does everything well. Its site-management facilities are weak, limited to an Explorer-like hierarchical file/folder view. There's no wizard to help you through the creation of complex sites. The HTML source editor is nothing special. There aren't as many extra goodies as some packages include, and it isn't the cheapest tool either.

But boy is it smooth. Just drag and drop absolutely anything into a *Visual Page* window and it's there, no questions asked. *Word* and *Excel* documents show up looking perfect, as do images of any format. Java applets and QuickTime movies run live in edit mode, unlike the placeholders you see in other editors. Frames and tables are ridiculously easy to manage, and the interfaces for editing and setting values on form components is point-and-click simple. All this makes previewing in a separate browser almost unnecessary, which is a beautiful thing.


Thought you'd seen everything? How 'bout drag-and-drop alien mugshots in an HTML table?

The included page templates support a wide variety of styles, and they're probably sufficient for creating a basic site, although you'll have to do the site-organization yourself. Once you've worked it out, though, you'll find the FTP-based publishing mechanism makes maintenance a no-brainer.

Although *Visual Page* doesn't seem to fill HTML files with strange tags and badly formatted code, it doesn't offer much to the HTML expert either. Nevertheless, it does what it does extremely well, and is well worth its asking price.

— *Neil Redding*

Price $100
Developer Symantec Corporation
Phone 800.441.7234
URL wwwsymantec.com

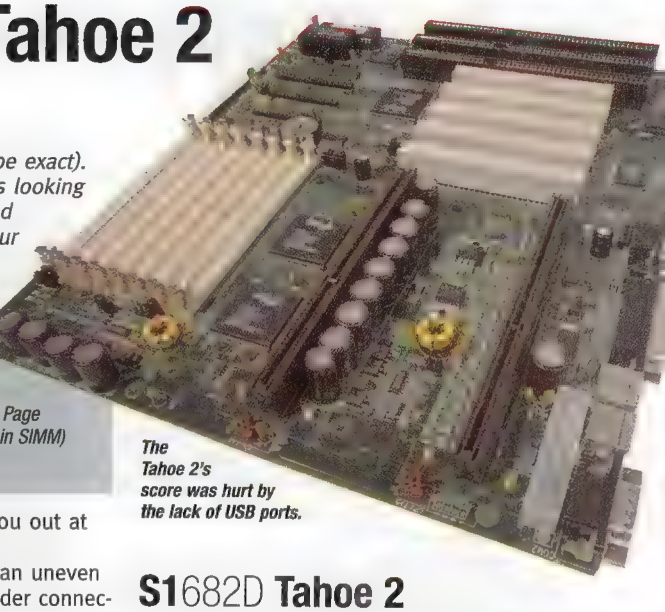
boot verdict 7

Tyan S1684 and S1682D Tahoe 2

One-by-one or two-by-two

Not too long ago we previewed Tyan's Pentium II motherboards (boot 10 to be exact). Now, with AGP right around the corner, the life span of Intel's 440FX PCIset is looking bleaker by the day. But what the hell: For those who can't wait for the Second Coming, here are two of Tyan's latest P-II motherboards, ready to meet all your processing needs.

— Andrew Sanchez



The Tahoe 2's score was hurt by the lack of USB ports.

S1684SA Tahoe-A

This single Slot 1 solution from Tyan has seven usable expansion slots, with three bus-mastered PCI slots, three ISA, and one shared PCI/ISA. We only wish they'd trade one of those ISA slots for a PCI slot (like its dual-CPU brother). The built-in Creative Lab's Vibra 16 sound chip (SB16 compliant) handles legacy support for older DOS games requiring 100 percent compatibility, so you can add that PCI sound card without worrying. All connectors—including twin USB ports and audio mini-connectors for mic-in, line-in, and line-out—are located on the ATX I/O connector.

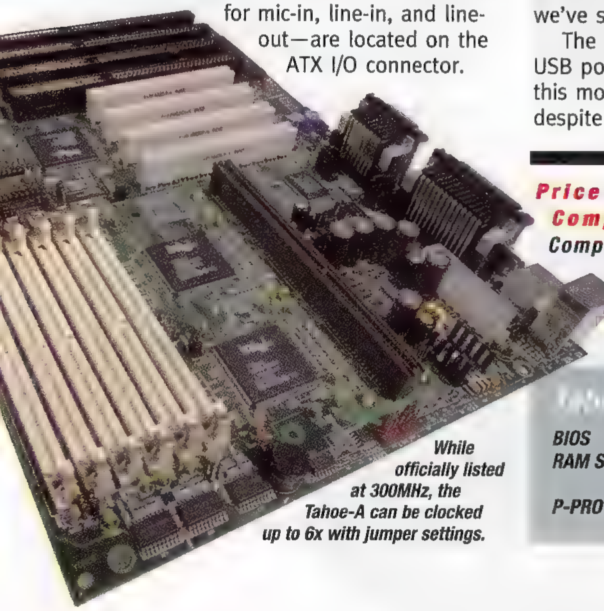
Dare to Compare

	Tyan S1684SA	**Tyan S1682D ***	**A.I.R. P6KPI**
Benchmark	*233Mhz/266Mhz*	*233Mhz/266Mhz*	*233Mhz/266Mhz*
bootMark	*108.7/128.7*	*109.6/127.02*	*113.3/128*
Memory Speed	*105.1/116.4*	*96.1/105.1*	*96.4/105.3*
Quake	*14.3/14.8*	*13.9/14.5*	*14.0/14.5*
FastVid Quake	*23.6/25.9*	*22.8/24.9*	*22.9/25.0*
GLQuake	*28.4/ 28.4*	*28.2/28.3*	*28.4/28.4*
DMA access	*37.3/37.4*	*37.7/38.0*	*36.3/34.0*
L2 cache speed	*243.8/278.6*	*243.8/278.6*	*244.4/279.3*
MDK PerfTest	*83/112*	*98/112*	*83/102*

Bold indicates best performance.

** The Tyan S1682D results were taken with a single CPU.*

***CONTROL SYSTEM: CPU** Intel Pentium II 233Mhz **RAM** 80MB EDO-DRAM **O/S** Windows 95 OSR2 Build 1111 **CD-ROM** Mitsumi FX120T **Hard Drive** Quantum 1280A **Video** Rendition Reference board (Verite V1000E) w/4MB EDO-DRAM, Diamond Monster 3D (3Dfx Voodoo) w/4MB EDO-DRAM*



While officially listed at 300MHz, the Tahoe-A can be clocked up to 6x with jumper settings.

Tahoe 2 Stats

BIOS	*AMI 7/15/95*
RAM SUPPORTED	*EDO-DRAM, Fast Page Mode, ECC (72-pin SIMM)*
P-PRO CPU CARD?	*Yes*

Six 72-pin SIMM slots max you out at 768MB of EDO-DRAM.

Layout-wise, the S1684SA is an uneven affair—drive header connectors sit between the top PCI slots. The processor is positioned perfectly next to an ATX power supply fan, and twin connectors for a CPU fan and internal fan are located right next to the CPU. The integrated power LED is also helpful, but the bunched-up pin-block should be separated, as on the S1682D.

The S1684SA performs on par with the P-II boards reviewed last month, although the average 233Mhz bootMark score of 108.7 slips behind Tekram's P6F40K-A5, which posted a 109.4 bootMark. *Quake* scores are very strong, while the *MDK* PerfTest score is the best we've seen for a single CPU P-II board.

The integrated Vibra 16 chip, integrated USB ports, and strong performance makes this motherboard a keeper—despite the uneven layout.

Price *$340*
Company *Tyan Computers*
Phone *408.956.8000*
URL *www.tyan.com*

boot verdict
9

Tahoe-A Stats

BIOS	*AMI 7/15/95*
RAM SUPPORTED	*EDO-DRAM, Fast Page Mode, ECC (72-pin SIMM)*
P-PRO CPU CARD?	*Yes*

S1682D Tahoe 2

The S1682D is aimed at dual-CPU freaks who are willing to pay for the CPU power. The seven expansion slots are decidedly PCI-skewed, with four bus-mastered PCI, two ISA, and the ever-popular shared PCI/ISA slot. Twin SEC slots position the processors for optimal ATX cooling. Three fan power connectors—one near each processor, and a lone chassis fan header connector—keep the juice flowing.

Eight 72-pin SIMM slots get you 512MB maximum system RAM, while jumper settings will get you to 400MHz if you so desire. Component layout on the board shares similarities with its single CPU brother, with floppy and hard drive header connectors straddling the top-most PCI slots. But this time Tyan opts for USB header connectors, forcing you to cough up a free slot for USB functionality. Why couldn't they just put it on the ATX I/O header connector?

Like the S1684S, this board is armed with a power LED, but this time, the pin-block is separated, making wire connections easier.

The S1682's performance lagged a hair behind the S1684S, posting slight slower scores almost across the board, although it did post excellent *MDK* PerfTest scores.

If Tyan puts that USB connector on the ATX I/O connector, we'd feel better about recommending the S1682. Hopefully, this little oversight will be fixed in the rev.

Price *$280*
Company *Tyan Computers*
Phone *408.956.8000*
URL *www.tyan.com*

boot verdict
7

24x **ATAPI** CD-ROM **Drive-By**

Unsafe at any speed

For those with the need for speed, an ATAPI 24x speed CD-ROM drive is the only antidote, right? Wrong! While manufacturers push these potent peripherals like street vendors hustling swag—hyping quality and wielding fancy terminology—these 24x drives don't deliver.

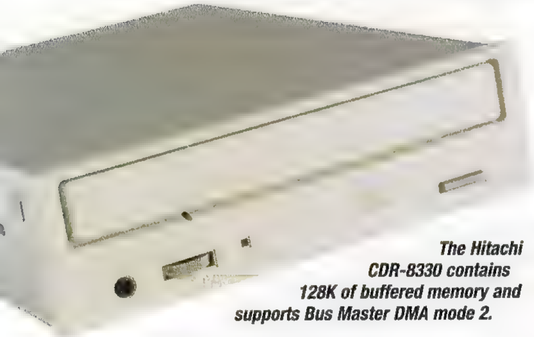
Ultimately, minimum speed is more important than any mythical maximum speed advertised. It's the speed the drive will typically be delivering data. Sadly, these drives never reach their full potential, delivering only 20x performance at best. And if your disc media isn't perfect, the high-speed drive head won't even read it at 3,600K/sec. And only some 50% of discs out there are up to spec.

All of these drives utilize Constant Angular Velocity (CAV) technology that spins the disc at a fixed velocity, regardless of where the head is positioned over the surface. Because the number of 2K data sectors varies greatly depending on the radial optical pick-up location, transfer rates of CAV drives increase toward the outer diameter of the disc. This means these 24x drives don't realize their full potential until well into the disc (the 450MB mark to be precise). And if the disc isn't full, that speed never happens.

—Sean Cleveland

Care to Compare

	Hitachi CDR-8330	Mitsumi FX240S	Panasonic LK-MC686BP	Teac CD-524E	Toshiba XM-6102B
CDTach READ TESTS					
16k Outside Tracks (K/sec.)	603	2,766	3,418	2,429	2,659
16k Center Tracks (K/sec.)	2,786	3,189	2,659	3,072	3,245
16k Inside Tracks (K/sec.)	1,601	1,801	1,531	1,782	1,870
CDTach SEEK TESTS					
Full Stroke (ms)	126	135	142	167	144
Random Access (ms)	68	84	74	89	83
CPU Overhead (ms)	10	11	9	9	8
CDTach CPU UTILIZATION TESTS					
2x (300 K/sec.)	2%	2%	2%	2%	2%
4x (600 K/sec.)	3%	4%	4%	4%	3%
6x (900 K/sec.)	Failed	5%	6%	6%	5%
8x (1200 K/sec.)	Failed	7%	7%	7%	7%
12x (1800 K/sec.)	Failed	10%	10%	11%	9%
20x (3000 K/sec.)	Failed	Failed	13%	Failed	Failed
CDTach BURST TESTS					
2k Burst (K/sec.)	8,373	7,748	8,584	8,229	8,344
8k Burst (K/sec.)	19,560	18,939	20,440	19,763	19,681
16k Burst (K/sec.)	26,009	26,965	28,579	27,992	27,911
CDTach DRIVE RATING					
Drive Speed	12.2x	16.2x	14.8x	15.5x	16.4x
COPY *WING COMMANDER IV* Disc #1 FILES TO HARD DRIVE					
Time to copy in Min:Sec	4:01	3:29	4:04	3:40	3:25



The Hitachi CDR-8330 contains 128K of buffered memory and supports Bus Master DMA mode 2.

Hitachi **CDR-8330**

One look at our performance chart shows the CDR-8330 dropping data like soapy dishes. CDTach revealed major problems reading outer sectors, yielding 4x speeds (600K/sec), and seriously affecting overall throughput. It did do a fine job with the Microsoft disc, due to the Radial Velocity mentioned in the sidebar. It also did well in other areas, clocking the best overall time in both the Full Stroke test (the time it takes to fully reset the drive head) and Random Access test (one of the most crucial tests for drive performance). And the CDR-8330's E-IDE (ATAPI PIO Mode 4) interface supports DMA Mode 2 to minimize CPU hits. Regardless, the overall numbers tell the truest tale: The CDR-8330 doesn't perform up to par.

***Price** $133*
***Developer** Hitachi America*
***Phone** 800.448.2244*
***URL** www.hitachi.com*

boot verdict 3

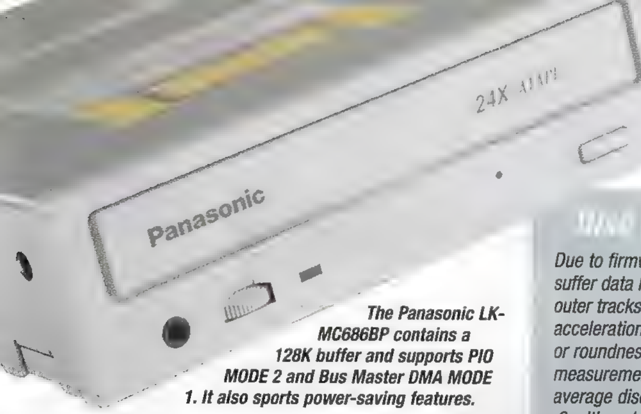
Mitsumi **FX240S**

This drive is a tank. Its solid build conjures thoughts of George Foreman. And it doesn't skimp on performance either, delivering the second best overall performance rating. Still—like all drives in this round up—the FX240S failed to deliver the advertised 24x speed, performing minimally as a 12x drive (1,800K/sec.). Combining both CLV and CAV modes, the FX240S varies its spin rate between 12x and 20x. A big thumbs up was its 3:29 copy time for the first *Wing Commander IV* disc to the hard drive, falling only four seconds short of the Toshiba drive—very impressive. But with a price tag equal to that of the Kick-Ass 12/20Plex SCSI drive from Plextor (a true 12x to 20x performer) reviewed last issue, it's not even a contender. Maybe it should have been entered in a lower weight class.

***Price** $249*
***Developer** Mitsumi Electronics*
***Phone** 214.550.7300*
***URL** www.mitsumi.com*

boot verdict 6

The Mitsumi FX240S contains a 256K buffer and supports both Bus Master DMA and Multi-Block Transfers.



The Panasonic LK-MC686BP contains a 128K buffer and supports PIO MODE 2 and Bus Master DMA MODE 1. It also sports power-saving features.

Panasonic LK-MC686BP (Matshita CR-585)

The LK-MC686BP is a 10x/17.5x performer being sold as a 24x drive. It even displays that claim across the front of the drive, taunting the user with promises of power, yet ultimately driving needles of dissatisfaction with every look at its bezel. Based on full-blown CAV architecture and harboring problems reading outside tracks, the LK-MC686BP was the slowest drive in this round up when it came to reaching full potential throughput. But on the other hand, it was the only drive to even approach its specified throughput on outside tracks. Even when not using high-quality discs. CPU Utilization revealed some of the lowest numbers in the group, and didn't crap out at 20x speed. It also pumped out the highest bursts, maxing out at almost 29K. The LK-MC686BP is reliable, if not impressive.

boot verdict 5

Price $199
Developer Panasonic
Phone 800.742.8086
URL www.panasonic.com

Wild Eccentricity

Due to firmware problems, 24x CD-ROM drives suffer data head problems reading information from outer tracks. The effect is directly affected by radial acceleration, which measures the eccentricity—or roundness—of a track on the disc. This measurement is listed in meters per second; an average disc measures somewhere around .2 to .3, although .4 is acceptable. The CDTach disc from TestaCD Labs we use for testing CD-ROM drives has a radial velocity of .158—good but not good enough. Current 24x drives need at least .1 to deliver the data flow necessary for 24x throughput at high speeds. For the 24x owner, this means dropped video frames and slower data retrieval when reading the outer tracks of a disc.

Teac **CD-524E**

The CD-524E's proprietary disc rotation technology maintains max speeds, and claims to never run slower than 12x. At least Teac kept its word about the minimum speed. This is yet another drive suffering severe performance lag when not reading perfect media. It also delivered the highest Full Stroke read (a whopping 170ms) and high Random Access times (87ms). Even though equipped with a new noise- and vibration-proof drive structure for improved playback of unbalanced media, the chart shows some interesting results. It geared up to higher speeds in steps rather than gradually, and playback was anything but smooth at high speeds. Its drive head must not be mounted firmly, as the CD-524E displays data dips despite keeping its velocity.

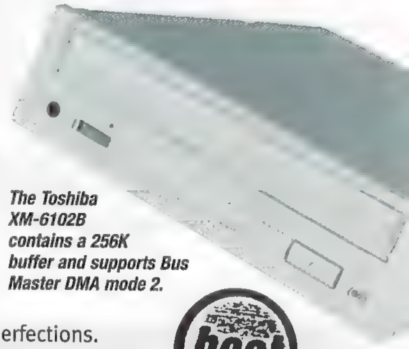
The Teac CD-524E contains 128K of buffered memory, supports PIO MODE 3 and MW DMA MODE 1, plus it has the lowest price of all of the drives reviewed.

boot verdict 4

Price $149
Developer Teac America
Phone 213.727.7672
URL www.teac.com

Toshiba XM-6102B

The anchor of this roundup is the venerable Toshiba drive. The XM-6102B manages to keep the title after this bout... barely. Using Partial Constant Angular Velocity technology (PCAV), along with a new motor and tray specifically redesigned to handle faster speeds while minimizing media vibration, the XM-6102B drove much like the Mitsumi drive. It reached its highest throughput at around 450MB, and leveled out with the highest overall throughput. It also copied the *Wing Commander IV* files to the hard drive in the fastest time (3:25 seconds). Alas, it also failed to read discs with any imperfections.

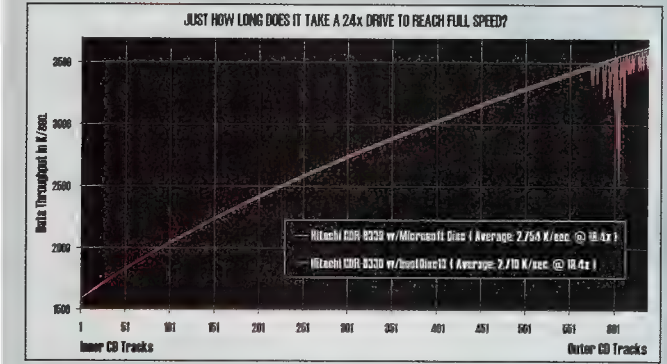


The Toshiba XM-6102B contains a 256K buffer and supports Bus Master DMA mode 2.

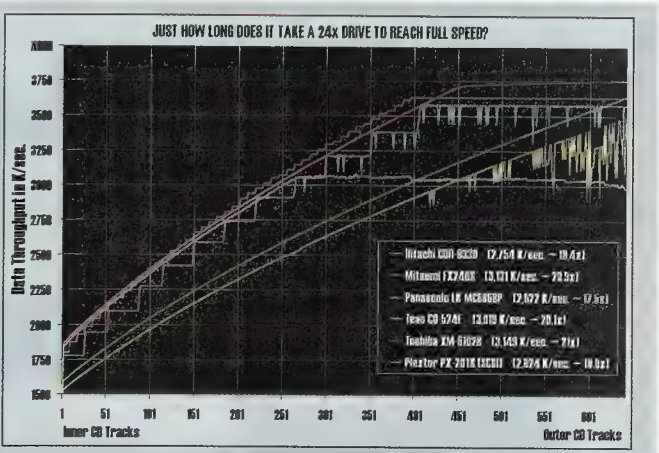
boot verdict 6

Price $185
Developer Toshiba America
Phone 714.457.0777
URL www.toshiba.com

"24x" Performance: I Dip, You Dip, We Dip



This chart compares the Hitachi drive using bootDisc13 and the .1 radial velocity disc to illustrate how drives drop data toward the end of the disc. Also notice how the Kick Ass Plextor drive (reviewed last issue) reaches full speed at around 250MB into the disc, and maintains it.



This chart shows how these drives actually perform when accessing data from various points on the physical platter. TestaCD Labs, the people who wrote our CD-ROM performance test CDTach, created the test to illustrates how long it takes a given drive to reach peak performance. Keep in mind that we used a disc with a rare radial velocity of better than .1 to illustrate ideal performance.

TeleVideo **SVP350** 21-inch SuperView **Pro**

Mongo Monitor Madness

boot KICK ASS! PRODUCT

It's called "Pro" for a reason: The 21-inch SVP350 displays luscious, bright colors with exacting clarity throughout all portions of the screen—perfect for color-correction and mission-critical design at high resolutions. We tried to stump the monitor with *DisplayMate's* Video Obstacle Course, but at 1600x1200@85Hz—the beast's highest resolution and refresh rate—it performed nearly flawlessly throughout every test. And pixel definition was superb given the monitor's .28mm grille pitch. Focus was excellent, moirés were non-existent, blacks were pitch black, and colors looked hotter than a field of neon bikinis. We found some slight, inconsequential bowing in the upper corners, and a minor green-red convergence miscue in the bottom right, but overall the SVP350 made the obstacle course look just plain silly.

The monitor hiccuped a bit when we dropped down to 1280x1024@85Hz, suggesting the "Pro" is indeed tuned to professional resolutions. At the lower res, we discovered more convergence problems, image expansion during bursts of intense contrast, and pronounced moiré patterns. It should be noted that the SVP350's drawbacks aren't dealbreakers, and *DisplayMate* does all it can to provoke glitches that appear infrequently during typical use. At 1280x1024, the monitor is still a winner.

The SVP350 provides a 19.9-inch diagonal viewing area through a capable anti-reflective screen. The tube is aperture grille, which means you get two fine horizontal lines across your display—not a bad trade off for the technology's superior brightness. Onscreen controls are easy to use, and include all the usuals, plus pincushion, pin balance, hour glass, hooking, tilt, moiré, convergence, focus, and color purity. This gigantic correction set will help you address any incongruities *DisplayMate* might uncover. The SVP350 also includes a BNC input so you can hook it up to two video sources.

While the monitor doesn't support resolutions higher than 1600x1200, it's a marvelous piece of craftsmanship for a competitive price.

—Jon Phillips

At 72 unwieldy pounds, the SVP350 is difficult to toss upon your desktop—but the results are well worth the trouble.

Price $1,649
Company Televideo
Phone 800.835.3228
URL www.televideoinc.com

boot verdict 9

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HOT!

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Satellite	220CDS	P133MHz	16/144MB	1.34GB	10X	12.1" SVGA DS	#44989	$1949	$78	$215.98
Satellite Pro	440CDX	P133MHz MMX	16/144MB	1.34GB	10X	12.1" SVGA HCA	#44991	$2399	$96	$229.98
Satellite Pro	440CDT	P133MHz MMX	16/144MB	1.34GB	10X	12.1" SVGA TFT	#44990	$3299	$132	$279.98
Satellite Pro	460CDT	P166MHz MMX	32/160MB	2.0GB	10X	12.1" SVGA TFT	#44992	$3749	$150	$279.98
Portege	300CT	P133MHz MMX	32/64MB	1.6GB	-	10.4" SVGA TFT	#44996	$3369	$135	$279.98
Portege	660CDT	P150MHz	16/80MB	1.2GB	10X	11.3" SVGA TFT	#38820	$4236	$169	$329.98
Libretto	50CT	P75MHz	16/32MB	810MB	-	6.1" SVGA TFT"	#44995	$1949	$78	$215.98
Tecra	500CDT*	P120MHz	16/144MB	1.26GB	6X	12.1" SVGA TFT	#48809	$1999	$80	$215.98
Tecra	510CDT	P133MHz	16/144MB	2.1GB	10X	12.1" SVGA TFT	#38819	$2399	$96	$229.98
Tecra	520CDT	P166MHz MMX	32/160MB	2.0GB	10X	12.1" SVGA TFT	#44993	$4249	$170	$329.98
Tecra	530CDT	P166MHz MMX	32/160MB	2.0GB	10X	12.1" XGA TFT	#44994	$4649	$186	$329.98
Tecra	730XCDT**	P150MHz MMX	16/144MB	2.0GB	10X	12.1" XGA TFT	#42396	$3899	$156	$279.98
Tecra	740CDT**	P166MHz MMX	16/144MB	3.0GB	10X	13.3" XGA TFT	#44948	$5499	$220	$429.98

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Acer	TI Extensa	610CD	P150	1.4GB	16MB	10X	6.4lbs	11.3" SVGA DS	#44942	$1799	$215.98
Acer	TI TravelMate	7060	P166 MMX	2.0GB	32MB	10X	7.0lbs	12.1" SVGA TFT	#44940	$3999	$279 98
AMS Tech	TravelPro	106CS	P166 MMX	1.3GB	16MB	-	6.9lbs	12.1" SVGA DS	#49373	$1799	$215.98
AMS Tech	TravelPro	1960CS	P166 MMX	2.1GB	16MB	16X	6.3lbs	12.1" SVGA DS	#49375	$2499	$229.98
AMS Tech	TravelPro	2020CX	P200 MMX	2.1GB	32MB	10X	6.3lbs	13.3" XGA TFT	#47339	$4799	$329.98
AMS Tech	TravelPro	2030CX	P200 MMX	3.1GB	48MB	16X	6.3lbs	13.3" XGA TFT	#47387	$5299	$429.98
AST	Ascentia	A60+	P150	1.0GB	16MB	–	7.0lbs	12.1" SVGA DS	#42438	$2749	$229.98
AST	Ascentia	M5200T	P200 MMX	2.1GB	32MB	20X	6.8lbs	12.1" SVGA TFT	#48890	$3599	$279.98
AST	Ascentia	P 70	P150 MMX	3.1GB	32MB	10X	7.1lbs	12.1" SVGA TFT	#42413	$3999	$279.98
AST	Ascentia	M5160X	P166 MMX	2.1GB	32MB	20X	6.8lbs	12.1" XGA TFT	#48891	$3999	$279.98
AST	Ascentia	P80	P166 MMX	3.0GB	32MB	10X	8.0lbs	12.1" SVGA TFT	#42415	$4489	$329.98
AST	Ascentia	M5230T	P233 MMX	3.3GB	32MB	20X	6.8lbs	12.1" SVGA TFT	#48892	$4499	$329.98
Compaq	Presario	1210	P150	1.4GB	16MB	14X	7.3lbs	12.1 SVGA DS	#47397	$2299	$229.98
Compaq	Presario	1610	P150 MMX	1.6GB	16MB	14X	7.3lbs	12.1 SVGA DS	#47398	$2699	$229.98
Compaq	Presario	1620	P166 MMX	2.1GB	16MB	20X	7.3lbs	12.1 SVGA DS	#49334	$2999	$229.98
Compaq	Armada	1530DM	P133 MMX	1.4GB	16MB	10X	7.7lbs	12.1 SVGA DS	#49330	$2499	$229.98
Compaq	Armada	1550DMT	P133	1.4GB	16MB	10X	7.4lbs	12.1 SVGA TFT	#47306	$2999	$229.98
Compaq	Armada	1580DMT	P150 MMX	2.1GB	16MB	10X	7.4lbs	12.1 SVGA TFT	#49329	$3499	$279.98
Compaq	Armada	7330T	P150 MMX	2.1GB	16MB	-	6.0lbs	12.1 SVGA TFT	#49360	$4399	$329.98
Compaq	Armada	7350MT	P166 MMX	2.1GB	32MB	-	6.0lbs	12.1 SVGA TFT	#49361	$4899	$329.98
Compaq	Armada	7710MT	P150 MMX	1.6GB	16MB	-	7.5lbs	12.1 SVGA TFT	#47307	$4399	$329.98
Fujitsu	LifeBook	435Dx	P133 MMX	1.3GB	16MB	10X	7.3lbs	12.1 SVGA DS	#50263	$1799	$215.98
Fujitsu	LifeBook	535TX	P133 MMX	2.0GB	16MB	10X	6.8lbs	12.1 SVGA TFT	#49319	$2799	$229.98
Fujitsu	LifeBook	555TX	P150 MMX	2.0GB	16MB	10X	6.8lbs	12.1 SVGA TFT	#47317	$3199	$279.98
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Fujitsu	LifeBook	635TX	P133 MMX	2.0GB	16MB	16X	4.4lbs	12.1 SVGA TFT	#49322	$3199	$279.98
Fujitsu	LifeBook	655TX	P150 MMX	1.3GB	16MB	8X	4.4lbs	12.1 SVGA TFT	#47319	$3799	$279.98
Fujitsu	LifeBook	656TX	P150 MMX	2.0GB	16MB	16X	4.4lbs	12.1 SVGA TFT	#49323	$4299	$329.98
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Hitachi	VisionBook	Plus 4150	P150 MMX	1.4GB	16MB	10X	6.5lbs	12.1 SVGA HS	#47363	$2299	$229.98
Hitachi	VisionBook	Plus 4360	P166 MMX	2.1GB	16MB	10X	6.5lbs	12.1 SVGA TFT	#47364	$3199	$279.98
Hitachi	VisionBook	Pro 7340	P133 MMX	1.4GB	16MB	10X	7.9lbs	12.1 SVGA TFT	#47365	$3199	$279.98
Hitachi	VisionBook	Pro 7360	P166 MMX	2.1GB	32MB	10X	7.9lbs	12.1 SVGA TFT	#47366	$4199	$329.98
Hitachi	VisionBook	Pro 7560	P166 MMX	3.0GB	32MB	10X	7.9lbs	13.3 XGA TFT	#47367	$4699	$329.98
Hitachi	VisionBook	Elite 8560	P166 MMX	2.1GB	16MB	10X	5.2lbs	13.3 XGA TFT	#47368	$4799	$329.98
IBM	ThinkPad	560	P133	2.1GB	8MB	–	4.1lbs	11.3" SVGA DS	#42370	$1949	$215.98
IBM	ThinkPad	380E	P150 MMX	2.1GB	16MB	Opt.	6.7lbs	12.1" SVGA FRSTN	#45961	$2099	$229.98
IBM	ThinkPad	380D	P150 MMX	2.1GB	16MB	8X	6.9lbs	12.1" SVGA TFT	#44905	$3279	$279.98
IBM	ThinkPad	760E	P150	2.1GB	16MB	Opt	6.4lbs	12.1" XGA TFT	#36738	$3499	$279.98
IBM	ThinkPad	380ED	P166 MMX	3.0GB	16MB	20X	7.1lbs	12.1" SVGA TFT	#45963	$3669	$279.98
IBM	ThinkPad	760ED	P133	2.1GB	16MB	6X	6.6lbs	12.1" XGA TFT	#36737	$3699	$279.98
IBM	ThinkPad	760XD	P166 MMX	3.0GB	32MB	10X	7.5lbs	12.1" XGA TFT	#42423	$4849	$329.98
IBM	ThinkPad	770	P200 MMX	3.2GB	32MB	Opt.	7.4lbs	13.3" XGA TFT	#45967	$4899	$329.98
IBM	ThinkPad	765D	P166 MMX	3.0GB	32MB	8X	7.7lbs	13.3" XGA TFT	#44961	$6699	$429.98
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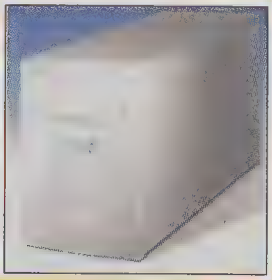

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Performantz 1400	13.2"	1024x768	0.28	60-120	VESA DPMS	#45559	$169.98

15" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
Hyundai DeluxScan 15G+	13.7"	1280x1024	0.28	50-127	VESA DPMS	#37271	$249.98
MAG InnoVision DJ-530	13.8"	1280x1024	0.28	50-120	MPR II/Jag Control OSD	#38737	$319.98
NEC MultiSync C500	13.8"	1280x1024	0.28	50-120	MPR II/Nutek	#86328	$389.98
NEC MultiSync M500	13.8"	1280x1024	0.25	55-120	Speakers, MPR II/Nutek	#86792	$379.98
Performantz 1500	13.7"	1280x1024	0.28	50-110	EPA/VESA	#45605	$229.98
Princeton E050	13.8"	1280x1024	0.28	40-120	FCC/MPR II	#35144	$285.98
Sony MultiScan 100sx	13.9"	1024x768	0.25	50-120	EPA/MPR II/Nutek	#82686	$369.98
Sony MultiScan 100sf	13.9"	1024x768	0.25	50-120	EPA/MPR II/Nutek	#82687	$419.98
ViewSonic 15GA PerfectSound	14"	1280x1024	0.27	50-160	Speakers, FCC/MPR II	#23484	$374.98

17" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
MAG InnoVision DJ-700	16.0"	1280x1024	0.25	50-110	MPR II/PnP	#38736	$549.98
NEC MultiSync M700	15.6"	1280x1024	0.25	60-120	Speakers, MPR II/Nutek	#86793	$769.98
NEC MultiSync P750	15.6"	1600x1200	0.25	55-160	MPR II/Nutek	#39138	$899.98
Performantz 1700 Color BEST BUY!	15.75"	1280x1024	0.28	50-120	EPA/MPR II	#47560	$449.98
Princeton E074T	16.1"	1280x1024	0.25	50-120	FCC/ISO 9001	#38738	$639.98
Princeton E076T	16.1"	1600x1200	0.25	50-120	FCC/ISO 9001	#38739	$715.98
Sony MultiScan 200sf	15.9"	1280x1024	0.25	50-120	EPA/MPR II/Nutek	#06687	$749.98
Sony MultiScan 200sx	15.9"	1280x1024	0.25	50-150	EPA/MPR II/Nutek	#06689	$699.98
ViewSonic 17GS	16"	1280x1024	0.27	50-160	FCC/MPR II	#23486	$594.98
ViewSonic GT770 SonicTron	15.9"	1280x1024	0.25	50-120	FCC/MPR II	#87296	$649.98
ViewSonic 17GA PerfectSound	16"	1280x1024	0.27	50-160	Speakers, FCC/MPR II	#23483	$639.98
ViewSonic PT775 SonicTron	16"	1600x1280	0.25	50-160	FCC/MPR II	#82696	$799.98

19" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
Optiquest V95	18"	1600x1280	0.26	50-150	TCO, Nutek	#47449	$974.98
Princeton E090	18"	1600x1200	0.26	50-200	TCO '95, EPA, Nutek	#47445	$859.98
Hitachi Superscan Elite 751	18"	1600x1200	0.22	50-160	MRPII, EPA	#43940	$1199.00

20"+ Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
NEC MultiSync E1100	19.8"	1600x1200	0.28	55-120	MPR II/Nutek	#80669	$1649.00
NEC MultiSync P1150	19.6"	1600x1200	0.25	55-160	MPR II/Nutek	#39139	$1999.00
Sony MultiScan 300sf	19.1"	1280x1024	0.25	48-150	EPA/MPR II/Nutek	#82688	$1499.00
Sony MultiScan W900	22.5"	1920x1200	0.25	50-160	EPA/MPR II/Nutek	#80665	$4699.00
ViewSonic G800 BEST BUY!	18.4"	1600x1200	0.28	50-120	FCC/MPR II	#40971	$1045.00
ViewSonic GT800 SonicTron	19.1"	1600x1280	0.30	48-150	FCC/MPR II	#87295	$1199.00
ViewSonic P810	20"	1600x1280	0.25	50-160	FCC/MPR II	#84136	$1475.00
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- One-year warranty

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#41037

Inkjet	Max. Std. Resolution	Page per Min B&W/Color	PS Fonts/ TT Fonts	RAM Std./Max.	Max. Paper Size	Warranty (Years)	Item #	ONLY
Canon BJC-240	360x360	3/.27	7/300	62K	8.5x14"	1	#34188	$169.98
Canon BJC-4200	720x360	5/1	7/300	64K	8.5x14"	1	#34189	$199.98
Canon BJC-620	720x720	4/1.7	7/300	60K	8.5x14"	1	#34190	$299.98
Canon BJC-4550 Wide	720x360	5/1	7/300	64K	11x17"	1	#34191	$499.98
Canon BJC-70 Portable	720x360	4/.8	7/20	35K	8.5x14"	2	#21969	$299.98
Epson Stylus Color 400	720x720	4/3	1	56K	8.5x44"	2	#80666	$199.98
Epson Stylus Color 600	1400x720	6/4	5/4	56K	8.5x44"	2	#80667	$299.98
Epson Stylus Color 800	1400x720	8/7	1	64K	8.5x44"	2	#80668	$449.98
Epson Stylus Color 1500	720x720	3/1	5/4	256K	13.6x21.78"	2	#86318	$479.98
HP DeskJet 340 Portable	300x300	3/2-4	6/0	16K	8.5x14"	1	#27969	$299.98
HP DeskJet 672C	600x300	5/1.5	0/32	512K	8.5"x banner	1	#40979	$199.98
HP DeskJet 694C	600x600	5/1.7	8/35	512K	8.5"x banner	1	#40994	$299.98
HP DeskJet 820Cse	600x600	6.5/4	0/50	128K	8.5x14"	1	#86326	$249.98
HP DeskJet 870Cse	600x600	8/4	26/126	1MB	8.5x14"	1	#36156	$399.98
HP DeskJet 1600C	600x600	9/4	1/35	4/100MB	8.5x14"	1	#31068	$1349.00
HP OfficeJet 1150C	600x300	8/4	125	512K	8.5x14"	1	#40999	$999.98

Laser	Max. Std. Resolution	Page per Min. B&W/Color	PS Fonts/ TT Fonts	RAM Std./Max.	Max. Paper Size	Warranty (Years)	Item #	ONLY
HP LaserJet 6Lse	600x600	6	0/26	1/9MB	8.5x14"	1	#41022	$399.98
HP LaserJet 6MP	600x600	8	35/75	2/50MB	8.5x14"	1	#82666	$949.98
HP LaserJet 5se	600x600	12	0/110	4/66MB	8.5x14"	1	#41021	$1049.00
Okidata OP4W	600x600	4		128K	8.5x14"	1	#34167	$199.98
Okidata 16n	600x600	16	35/10	6/34MB	8.5x14"	1	#40988	$899.98
Minolta Pageworks 6L	600x600	6	0/96	256K/4.25MB	8.5x14"	1	#45718	$299.98
Minolta Pageworks 12	600x600	12	0/106	4/36MB	8.5x14"	1	#45719	$899.98
Minolta Pageworks Color	600x600	12/3	0/10	4/68MB	8.5x14"	1	#45721	$2999.00
Tektronix Phaser 350 Color	300x300	6/6	17/69	8/24MB	8.5x11"	1	#45707	$3199.00
Tektronix Phaser 560 Color	600x600	14/5	17/39	20/72MB	8.5x14"	1	#49477	$4250.00
GCC Elite 1212	1200x1200	12	35/15	8/64MB	8.5x14"	1	#40936	$1399.00
GCC Elite XL608	600x600	8	80/15	8/64MB	11x17"	1	#91381	$2399.00

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Item #	Product	Price
47557	Sound Blaster AWE64 Value	$92.01
47526	Sound Blaster Discovery AWEB64/2400	$248.44
47524	Sound Blaster Performance AWE64 Gold	$322.06
47525	Sound Blaster Valve AWE64/1800	$220.83
	Mitsumi	
43137	Mitsumi 8X ATAPI Internal CD-ROM Drive	$75.00
	NEC	
36157	Multispin 8Xe CD-ROM Drive	$379.98
36158	Multispin 8Xi Internal CD-ROM Drive	$279.98
	NewCom	
38701	NewCom 12X CD-Rom Drive Internal IDE	$101.14
38702	NewCom 12X Internet Multimedia Kit	$157.95
35110	NewCom 8X CD-ROM Drive Internal IDE	$89.77
38709	NewCom 8X Internal Multimedia Game Kit	$159.09
	Philips	
38711	Philips CDD2600/20 External CD Recorder	$535.10
	Sanyo	
43138	Sanyo 20x ATAPI Internal CD-ROM Drive	$135.23
	Sony	
40982	DiscMan 6X CD-ROM PRD-650	$349.98
47535	Sony 12X SCSI 2 Internal CD-ROM Drive	$130.68
47534	Sony 16X ATAPI Internal CD-ROM Drive	$95.45

Media

Item #	Product	Price
	Iomega	
36337	Ditto 2GB Tape Cartridge 3-Pack	$59.95
36336	Ditto 2GB Tape Cartridge Single	$19.98
34701	Ditto 3200 Cartridge Single	$49.95
83370	Jaz Media 1GB Pre-Formatted	$124.95
22338	Zip Media PC100 10-Pack	$149.95
22337	Zip Media PC100 3-Pack	$49.95
26184	Zip Zoom SCSI Accelerator	$49.95
	Kodak	
83580	CD-R 74-min Media	$5.88
	Nomai	
39173	CD-R 74-min Media	$4.98
	Panasonic	
87561	PowerDrive 2 650MB PD Media	$44.98
	Performantz	
40359	SyQuest Compatible EZ135MB Cartridge	$14.98
	Philips	
89805	CD-R 74-min Cartridge	$4.89
	Sony	
14368	Sony CD-R 650MB (74-min)	$3.82
14358	Sony DG90M 4mm Data Cart 2GB	$6.34
14397	Sony QD6525 1/4" Data Cart 525MB	$20.85
	SyQuest	
33325	EZFlyer 230 Cartridge 10-Pack	$199.98
33322	EZFlyer 230 Cartridge 5-Pack	$109.98
34705	EZFlyer 230 Cartridge Single	$24.98
33318	EZFlyer 230 PC Cartridge 3-Pack	$69.98
36330	SyJet Cartridge 3-Pack	$299.98
36331	SyJet Cartridge 5-Pack	$519.98
36329	SyJet Cartridge Single	$124.98
97992	SyQuest 270MB 3.5" Removable Cartridge	$52.98
24909	SyQuest EZ135MB 3.5" Cartridge 5-Pack	$98.58
24998	SyQuest EZ135MB Cartridge (PC or Mac)	$23.98
	Verbatim	
17895	mm DL 90m 2.0GB Tape	$6.02

Processor Upgrades

Item #	Product	Price
	Evergreen Technology	
30349	Evergreen 586/133	$100.57
	Intel	
32015	Intel Pentium Overdrive 120/133MHz for P60/66	$186.43
32016	Intel Pentium Overdrive 120/133MHz P75	$352.52
32018	Intel Pentium Overdrive 166MHz for P100	$405.63
28615	Intel Pentium Overdrive 83MHz	$186.43
46812	Intel Pentium Overdrive MMX150	$318.63
	PowerLeap	
40381	PL386 Upgrades 386DX to 486SX 50/66MHz	$92.39
40380	PL586 Upgrades 486SX/DX/DX2	$92.39

Surge/Back-Up

Item #	Product	Price
	American Power	
94359	APC Back-UPS 200	$87.53
05901	APC Back-UPS 450	$171.52
11651	APC Back-UPS 600	$258.10
88537	APC Back-UPS Pro 1000	$376.17
81900	APC Back-UPS Pro 420 PnP	$236.68
94395	APC Personal Surge Arrest 7-Outlet w/Phone	$19.81
94394	APC Prof Surge Arrest 7-Outlet	$25.03
94393	APC Prof Surge Arrest 7-Outlet w/Phone	$31.92
99364	Back-UPS 400	$139.98
26812	Back-UPS 650 Pro PnP	$287.31
85595	Back-UPS Office	$168.87
83574	Back-UPS Pro 280 PnP	$143.54
	Best Power	
38891	Fortress II 520VA UPS	$313.60
38892	Fortress II 720VA UPS	$368.73
38895	Fortress Rackmount 1020VA UPS	$505.64
38889	Patriot Plus 650VA UPS	$238.17
38890	Patriot Plus 920VA UPS	$376.26
38887	Smart Patriot 280VA UPS	$85.58
38888	Smart Patriot 420VA UPS	$117.02
	Optiquest	
34526	OPTI-UPS 280 PnP	$96.09
34527	OPTI-UPS 420 PnP	$144.13
25890	OPTI-UPS 650E	$220.11
34522	OPTI-UPS 1400	$411.17

Mobile-Windows CE

Item #	Product	Price
	Casio	
42937	Cassiopeia A10 w/2MB RAM	$499.98
41732	Cassiopeia A11 w/4MB RAM	$499.98
	Compaq	
42915	PC Companion C120	$399.98
42916	PC Companion C120+	$499.98
	Philips	
42941	Velo 1 Handheld PC	$639.98

Mobile-Combo Modem/Network

Item #	Product	Price
	MEGAHERTZ	
41248	XJACK 33.6 & Ether Combo 10T/102 PC Card	$298.98
41189	XJACK 33.6 & Ether Combo PC Card 10T	$269.98
44262	XJACK 33.6 PC Card Modem	$209.98

Mobile-Network PC Cards

Item #	Product	Price
	Global Village	
46325	Global Village 56K Flex Modem PC Card	$208.98
46324	Global Village 56K Flex Modem/ Ethernet PC Card	$312.50
	Megahertz	
44283	Sportster 33.6 PC Card for Win & DOS	$188.98
24845	XJ 10BC PCMCIA XJACK 10T/BNC	$99.98
44262	XJACK 33.6 PC Card Modem	$200.00
39617	XJACK 33.6 PC Card Modem Cell Capable	$211.96
44261	XJACK 56K PC Card Modem	$222.83

Mobile-SCSI/Serial Adapters

Item #	Product	Price
	Fujitsu	
30803	LAN/SCSI Combo PC Card	$175.27
	New Media	
39622	Basics SCSI (DB-25) PCMCIA Adapter	$87.21
	Socket Communications	
19936	I/O PCMCIA Serial Adapter	$135.37
34594	Infrared Serial Adapter	$159.98

Mobile-Portable CD-ROMs

Item #	Product	Price
	Addonics	
35350	Portable 4X4 CD-ROM Changer	$363.64
	Fujitsu	
36258	EigerMedia 6X CD-ROM w/PCMCIA Adapter	$318.18
	Microsolutions	
35366	Backpack PD/CD-ROM Drive	$417.05
31079	Backpack Plug and Play 4X CD-ROM Drive	$193.18
31890	Backpack Plug and Play 4X CD-ROM Drive w/Sound	$257.95
35363	Backpack Plug and Play 8X CD-ROM Drive	$251.14
35352	Backpack Plug and Play 8X CD-ROM Drive w/Sound	$321.59

Mobile-Multimedia Cards

Item #	Product	Price
	AIMS Lab	
40400	Grabit Video Capture	$119.32
	AITech	
30634	Pocket Scan Converter	$96.70
	New Media	
39624	Basics GAMEport	$56.82
30316	Gamejammer PCMCIA	$170.45
35105	Laptalk Stereo Speakers	$43.14
26023	WAVjammer 16-bit PCMCIA Sound Stereo	$204.55

Mobile-Hard Drives

Item #	Product	Price
	Simple Technology	
39153	1.08GB for IBM ThinkPad 355, 360, 750	$453.41
37770	1.3GB for IBM ThinkPad 355, 360, 751	$507.95
37773	2.1GB for IBM ThinkPad 355, 360, 752	$622.73

Mobile-Cases

Item #	Product	Price
	Targus	
91934	Targus Leather Case with CPU Purchase Promo	$69.98
06610	Targus Leather NoteBook Case – Black	$88.23
06023	Targus Notepac Case – Black	$28.41
07454	Targus Universal PowerBook Case	$59.09
	Terrapin	
90783	TGL400 Leather Mobile – Black	$99.98

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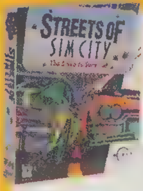

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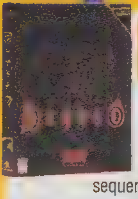

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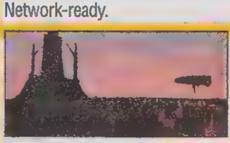

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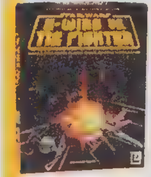

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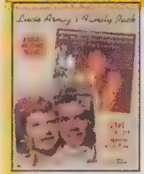

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Industry Standard 72pin Parity SIMMs					
4MB	(1x36)	72pin	70ns	#14673	$29.98
8MB	(2x36)	72pin	70ns	#13126	$59.98
16MB	(4x36)	72pin	70ns	#12373	$89.98
Industry Standard 72pin Non-Parity SIMMs					
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4MB	(1x32)	72pin	60ns	#06734	$24.98
8MB	(2x32)	72pin	70ns	#06755	$39.98
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4MB	(1x32)	EDO	60ns	#28336	$19.98
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JTS	Champ	2.0GB	EIDE-2/Fast ATA-2	14ms	128K	4200	16.6MB/sec	3yr	#33308	$179.98
JTS	Champion	3.0GB	EIDE-2/Fast ATA-2	12ms	256K	5400	16 6MB/sec	3yr	#47546	$219.98
Fujitsu	Winchester	1.284GB	EIDE-2/Fast ATA-2 🏁	10ms	128K	5400	16.6MB/sec	3yr	#35378	$165.98
Fujitsu	Winchester	1.700GB	EIDE-2/Fast ATA-2 🏁	10ms	128K	5400	16.6MB/sec	3yr	#35379	$169.98
Fujitsu	Winchester	2.16GB	EIDE-2/Fast ATA-2 🏁	10ms	128K	5400	16.6MB/sec	3yr	#33303	$199.98
Fujitsu	Winchester	2.56GB	EIDE-2/Fast ATA-2 🏁	10ms	128K	5400	16.6MB/sec	3yr	#33304	$219.98
Quantum	Fireball ST	1.614GB	Ultra ATA	10ms	128K	5400	16.6MB/sec	3yr	#45590	$209.98
Quantum	Fireball ST	2.151GB	Ultra ATA	10ms	128K	5400	16.6MB/sec	3yr	#45591	$215.98
Quantum	Fireball ST	3.228GB	Ultra ATA	10ms	128K	5400	16.6MB/sec	3yr	#45592	$265.98
Quantum	Fireball ST	4 310GB	Ultra ATA	10ms	128K	5400	16.6MB/sec	3yr	#45593	$349.98
Quantum	Fireball ST	6.448GB	Ultra ATA	10ms	128K	5400	16.6MB/sec	3yr	#45594	$549.98
Seagate	Medalist	1 275GB	EIDE-2/Fast ATA-2	12.5ms	64K	4500	16.6MB/sec	3yr	#34538	$165.98
Seagate	Medalist	1.7GB	EIDE-2/Fast ATA-2	12ms	128K	4500	16.6MB/sec	3yr	#39186	$185.98
Seagate BEST BUY!	Medalist	2.113GB	EIDE-2/Fast ATA-2	12ms	128K	4480	16.6MB/sec	3yr	#39187	$169.98
Seagate	Medalist	2 56GB	EIDE-2/Fast ATA-2	11ms	128K	5400	16.6MB/sec	3yr	#35377	$219.98
Western Digital	Caviar	1.281GB	EIDE/Fast ATA	11ms	256K	5200	16.6MB/sec	3yr	#34546	$169.98
Western Digital	Caviar	1.624GB	EIDE-2/Fast ATA-2	12ms	128K	5200	16.6MB/sec	3yr	#36349	$179.98
Western Digital	Caviar	2.100GB	EIDE-2/Fast ATA-2 🏁	12ms	128K	5200	16.6MB/sec	3yr	#39180	$199.98
Western Digital	Caviar	2.559GB	EIDE-2/Fast ATA-2 🏁	12ms	128K	5200	16.6MB/sec	3yr	#34549	$229.98
Western Digital	Caviar	3.100GB	EIDE-2/Fast ATA-2 🏁	12ms	128K	5200	16.6MB/sec	3yr	#35370	$239.98
Western Digital	Caviar	4.001GB	EIDE-2/Fast ATA-2 🏁	11ms	256K	5200	16.6MB/sec	3yr	#44530	$289.98

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Mfr.	Series	Capacity	Interface	Access	Cache	RPM	Transf. Rate	Wty.	Item #	PRICE
Seagate	Hawk 2XL	2.14GB	Ultra SCSI	9ms	256K	5400	up to 20MB/sec	5yr	#34556	$439.98
Seagate	Hawk 2XL	2.14GB	Ultra Wide SCSI	9ms	512K	5400	up to 40MB/sec	5yr	#34557	$529.98
Seagate	Cayman	2.14GB	Fast SCSI-2	8.5ms	512K	7200	up to 10MB/sec	5yr	#43103	$315.98
Seagate	Barracuda 4LP	2.15GB	Ultra SCSI	8.8ms	512K	7200	up to 20MB/sec	5yr	#34560	$519.98
Seagate	Barracuda 4LP	2.15GB	Ultra Wide SCSI	8 8ms	512K	7200	up to 40MB/sec	5yr	#34561	$555.98
Seagate	Barracuda 4LP	4.35GB	Ultra SCSI	8.8ms	512K	7200	up to 20MB/sec	5yr	#34565	$749.98
Seagate	Barracuda 4LP	4.35GB	Ultra Wide SCSI	8.8ms	512K	7200	up to 40MB/sec	5yr	#34566	$819.98
Seagate	Barracuda*	9.10GB	Ultra SCSI	9ms	512K	7200	up to 20MB/sec	5yr	#39192	$1339.00
Seagate	Barracuda*	9 10GB	Ultra Wide SCSI	9ms	512K	7200	up to 40MB/sec	5yr	#39193	$1369.00
Western Digital	Enterprise	2.17GB	Ultra SCSI	8ms	512K	7200	up to 20MB/sec	5yr	#35395	$489.98
Western Digital	Enterprise	2.17GB	Ultra Wide SCSI	8ms	512K	7200	up to 40MB/sec	5yr	#35396	$499.98
Western Digital	Enterprise	4.36GB	Ultra SCSI	8ms	512K	7200	up to 20MB/sec	5yr	#35397	$689.98
Western Digital	Enterprise	4.36GB	Ultra Wide SCSI	8ms	512K	7200	up to 40MB/sec	5yr	#35398	$779.98
Fujitsu	Allegro III	4.22GB	Ultra SCSI	8ms	512K	7200	up to 20MB/sec	5yr	#35387	$619.98
Fujitsu	Allegro III	4.22GB	Ultra Wide SCSI	8ms	512K	7200	up to 40MB/sec	5yr	#45595	$689.98
Fujitsu	Allegro III	9.10GB	Ultra SCSI	10ms	512K	7200	up to 20MB/sec	5yr	#35388	$1099.00

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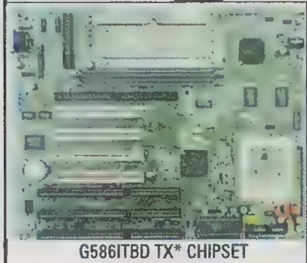

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- Microsoft Windows 95 CD Release 2
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Pentium II-233 MMX	$1899	$62/mo.
Pentium II-266 MMX	$1999	$65/mo.
Pentium II-300 MMX	$2199	$72/mo.

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- 512K L2 Pipeline Burst Cache
- 32MB EDO 60ns Memory
- Intel Triton 430VX PCI Chipset
- Teac 3.5" 1.44MB Floppy Drive
- Western Digital 3.1GB EIDE HD, 9ms
- Diamond Stealth3D 64-Bit PCI SVGA MPEG Graphics Accelerator w/ 4MB EDO RAM
- **Toshiba 24X Max EIDE CD-ROM Drive**
- Creative Labs Sound Blaster AWE64 Value Edition Wavetable Stereo Sound Card
- USRobotics Sportster 33.6 Fax/Modem, Upgradable to X2 56K Technology
- Mid Tower Case w/ Dual Fans
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- Monitor Not Included

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Pentium-200 MMX	$1299	$42/mo.
Pentium-233 MMX	$1459	$48/mo.
K6-166 MMX	$1159	$38/mo.
K6-200 MMX	$1259	$41/mo.
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24X Panasonic Enhanced IDE CD-ROM Drive
Sound Blaster 64 AWE
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Stereo Headset With Built In Microphone
Matrox Mystique 4MB SGRAM Video
17" Digital Non-Interlaced 1280 x 1024 Monitor
56k US Robotics X2 Internal Voice/Fax/Speaker/Modem
Microsoft Ergonomic Win '95 Keyboard
Microsoft 2-Button Mouse
Inlite Tower Case With UL Approved 250 Watt Power Supply
Surge Protector

Included Software
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Microsoft Excel '97
Microsoft Word '97
Microsoft Access '97
Microsoft PowerPoint '97
Microsoft Outlook '97
Windows '95 Service Release II With Internet Start-Up Kit
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RealAudio Player, , Vienna SoundFont Studio
Creative Media Deck, Creative WaveStudio
Creative Soundo'le, Creative TextAssist
MIDI Orchestrator Plus, Creative VoiceAssist
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Stereo Headset With Built In Microphone
Diamond Stealth64 MPEG Video
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Millenium II 2MB Memory Upgrade
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Apocalypse 5D (2MB) rev2
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Stealth64 Video 2001 & MVP 1100 (2MB)

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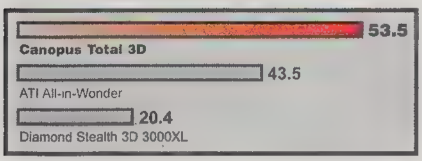

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PC Magazine, 3D Showdown, by Jan Ozzer (June 24. 1997)

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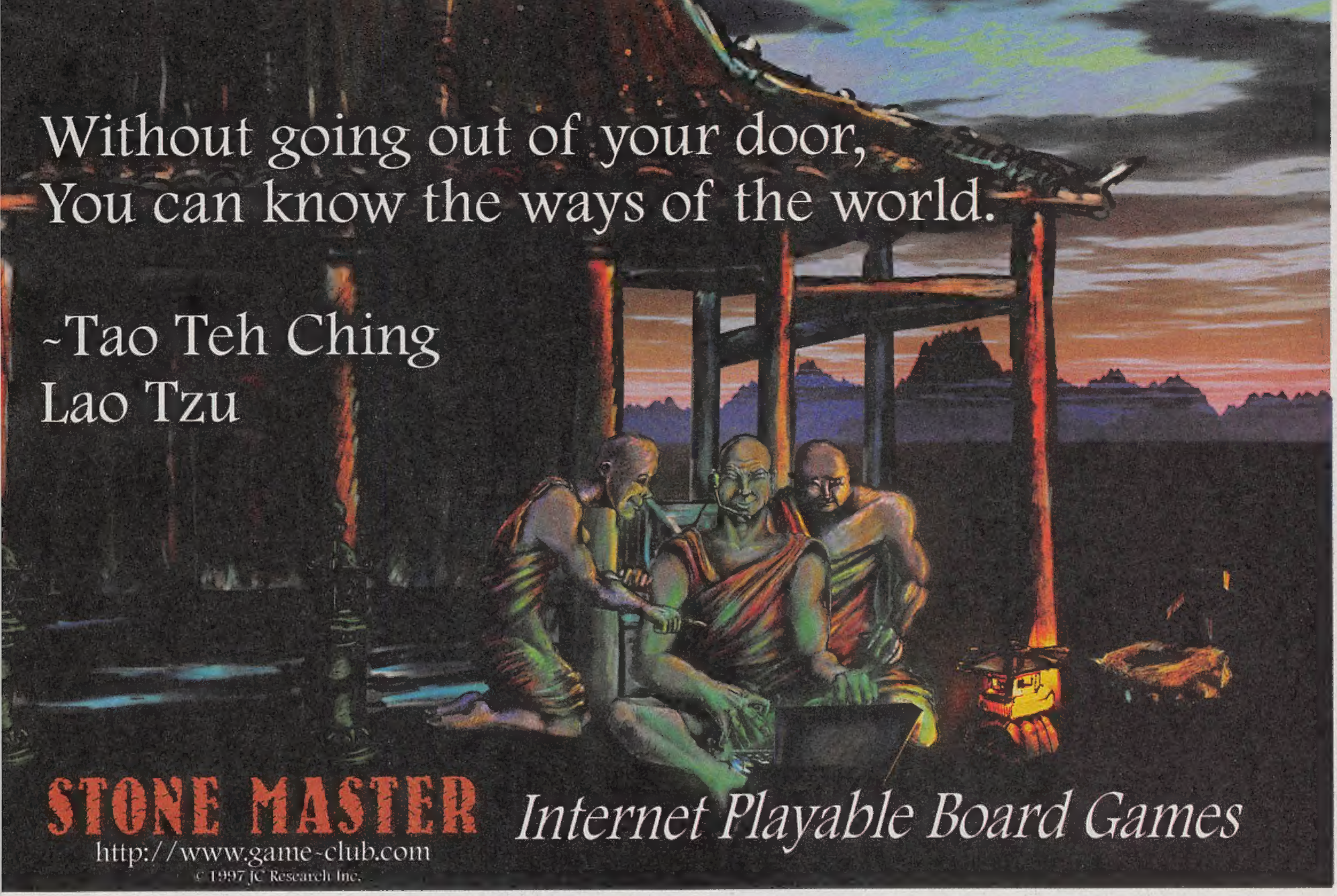
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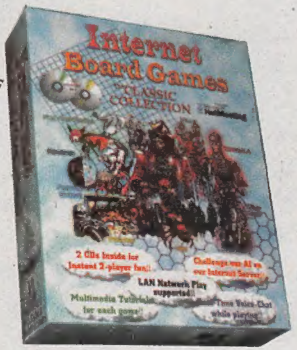
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Who says a PC has to be "fast" and "powerful"? Who says the ISA bus isn't "good enough"? At Jackie Amico's ISATORIUM, we sell only the finest ISA cards—and they're slow as hell! *Cecil Fielder slow. Geo Metro slow. Mayberry, R.F.D. slow.* Don't let the PC98 spec push you around like a Pelican Bay maytag, and don't let your open ISA slots go to waste. Fill a "hole" today...

ISA Piranha Card

"What's that smell?" It's the smell of raw electricity coursing through Pure Piranha Power! And it's stinking up your computer case like a poorly ventilated deli counter during a Brooklyn heat wave. Fulfills all your fish-computing needs! *(NOTE: Has no functional purpose; limit four per order.)*

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#390005....................

ISA PCI Graphics Card

The perfect solution for PCI slot "have-nots." Jackie Amico and friends have secured a large shipment of circa-1994 bargain basement graphics controllers—and now they're retrofitted for ISA slot insanity! Get "stupid" with yesterday's technology. *(NOTE: Drivers failed during beta testing.)*

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#380064....................

The ISA Tower

Give your computer the gift of high culture—and high-band radio frequencies! Guaranteed to wreak electro-madness on all your system components, leaving them edgy and aggressive—like the wife of tennis player Jeff Tarango, the lady who slapped the ref. She's French, isn't she? *(NOTE: Many Americans think French people are rude.)*

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#Q4007....................

ISA Mouse

Why waste a serial port when you can plug your mouse into an ISA slot? No reason, really. And that's why the ISA Mouse is the perfect solution for people who just like plugging things into other things, and then seeing what happens, if anything. *(NOTE: You will not be able to use the ISA Mouse when you plug it directly into your motherboard, and close the case.)*

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#400044....................

ISA-Cream

ISA scream, yousa scream, we all'a scream for ISA-Cream—the amazing PC confection! The perfect add-on card for kiddies! Just don't let them reach in the case without proper grounding, or until they've finished all their broccoli. *(NOTE: ISA-Cream requires an internal case temperature of less than 29 degrees Fahrenheit; three fans, peltier cooler, and CPU removal recommended).*

$19

#550007....................

ISA Master Stereoscope 3D Pro

PCI, schmee, schmee, schmi—the ISA bus is *the* bus for amazing 3D graphics acceleration! The ISA-Master requires no drivers: All you need is elbow grease to push the little orange lever—and frame rates into the high-20s are possible if you're willing to "push" the "peddle" to the "metal." Bundled titles include *Jungle Book* and *Escape From Witch Mountain*. *(NOTE: Does not support Direct3D, OpenGL, GLIDE, or any API known to man.)*

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#330012....................

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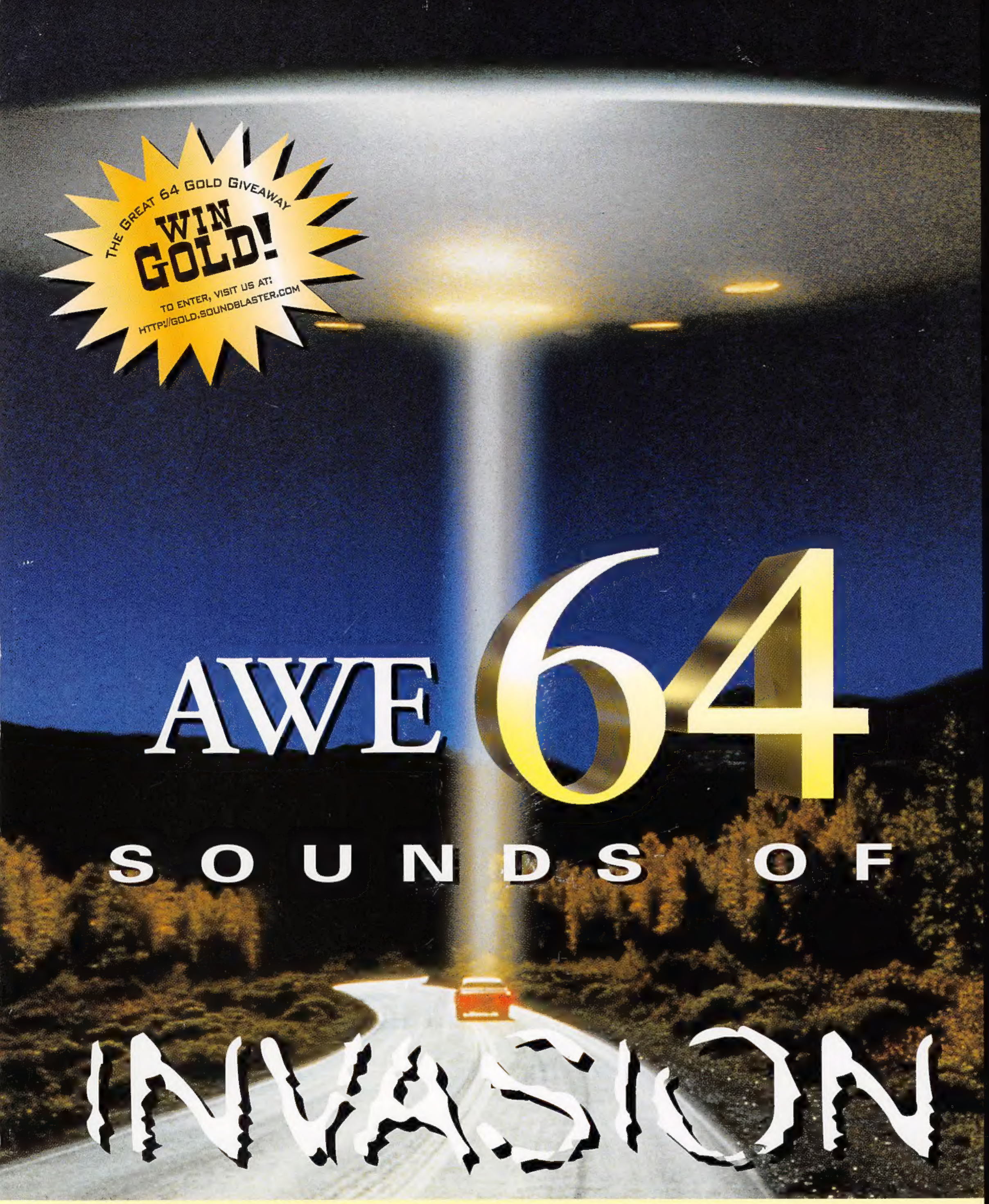

1. "We Come In Peace."
2. Blasting Ray Guns.
3. People Screaming.
4. "You Must Believe Me!"
5. Exploding Buildings.
6. Whirring Space Ships.
7. Brains Being Sucked.
8. Bones Crunching.
9. Aliens Phoning Home.
10. Metallic Scraping.
11. Cars Crashing.
12. Kidneys Bursting.
13. Insertion of Probes.
14. Heads Exploding.
15. "Run for Cover!"
16. "Warning."
17. Aliens Melting.
18. Pods Hatching.
19. Destroying the Monster.
20. Buildings Imploding.
21. Spaceships Docking.
22. Boiling Flesh.
23. "Mayday, Mayday!"
24. Exploding Spaceship.
25. People Running.
26. "I saw a UFO!"
27. Planes Taking Off.
28. "We're at DefCon 1."
29. Aliens Communicating.
30. Children Crying.
31. Slurp.
32. Clink of Autopsy Instruments.
33. Laser Swords Crashing.
34. "Hyperspace!"
35. Flesh Being Torn Off Bones.
36. "They're Coming."
37. Wailing Sirens.
38. "You Must Die."
39. "Beam Me Up."
40. Zap!!!
41. Air Locks Closing.
42. "Oh, My God!"
43. Lasers Charging Up.
44. "We Need More Power!"
45. Ray Guns Blasting.
46. Calling the Mothership.
47. Horns Blaring.
48. "We Won!"
49. "Lock on Target!"
50. Crystals Charging.
51. Area 51 Guard: "No Admittance."
52. Zap-Zap!
53. Warning Alarms.
54. Air Locks Opening.
55. "Set to Stun!"
56. "Red Alert!"
57. Shields Up.
58. Warp Speed.
59. "Blast 'em!"
60. Eyeballs Squishing.
61. Spaceships Cloaking.
62. Radar Ping.
63. "Fire at Will!"
64. "Take Me to Your Leader."

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